4.2 BIOLOGICAL RESOURCES

4.2.1 Affected Environment

The biological resources section focuses on plant and animal species habitats within the proposed study area. Screening studies were completed to assist in determining the presence of the plants, animals, and habitats that Federal and state resource management agencies consider deserving of special consideration in resource planning and development activities.

Biological resources were evaluated by reviewing existing literature, discussing species-specific information with agencies, and observations made during site visits to the study area. Pedestrian surveys were restricted to nonagricultural and nonurban habitats. Surveys of habitats within the ROW were conducted on June 25 through June 28, 2001; November 28, 2001; February 21 through February 22, 2002; and August 23, 2002. Wildlife observations and habitat characterizations were recorded during these surveys. Indications of wildlife presence that were noted included direct sightings, scat, tracks, burrows, and other signs. Vegetation communities were characterized in the field and mapped on aerial photos. Table C-1 in Appendix C summarizes observed habitat within the study area. Additional surveys would be conducted for the selected action as determined by the ROD. This information would be used to prepare the biological assessment.

4.2.1.1 Resource Study Area

The study for biological resources defined as the transmission line corridor from the O'Banion Substation south to the Tracy Substation, a total of approximately 100 miles, with an approximate width of 125 feet. In some cases, the survey width extends beyond the proposed right-of-way (ROW) when biological resources of concern could be directly or indirectly impacted.

4.2.1.2 Issues of Environmental Concern

Issues of environmental concern include areas of designated critical habit, special-status wildlife and plants, and sensitive habitat types. These issues are described in detail below.

Designated Critical Habitat

Critical habitat was identified as an issue of concern to both the EPA and the U.S. Fish and Wildlife Service (USFWS). Critical habitat is defined in 50 CFR 424.02 as "the specific areas within the geographic area currently occupied by a species, at the time it is listed in accordance with the Act (*Federal Endangered Species Act* of 1973), on which are found those physical or biological features essential to the conservation of the species and that may require special management considerations or protection, and . . ." Either the USFWS or the National Marine Fisheries Service (NMFS) may list critical habitat.

Special-status Wildlife and Plant Species

Special-status species are those plants and animals that are of concern to Federal, tribal and state resource management agencies. These may include endangered or threatened species, organisms with declining populations, or vanishing habitats. Table C-2 in Appendix C summarizes special-status species that have been identified as occurring or potentially occurring in the study area.

Special-status species that may occur in the study area were identified by searching the California Department of Fish and Game (CDFG) California Natural Diversity Data Base (CNDDB), and from correspondence with the USFWS and NMFS (refer to Appendix C for the CNDDB results and agency letters). The CNDDB was searched on June 20, 2001, for each U.S. Geological Survey (USGS) 7.5-minute quadrangle within which the Proposed Action ROW occurs. The species list provided by the USFWS on October 29, 2001, contains the special-status species known to occur in the study area. The list provided by the NMFS on April 27, 2001, contains species known to occur within the aquatic systems crossed by the Proposed Action ROW. Both lists are summarized in Appendix C.

Sensitive Habitat Types

Wetlands, primarily vernal pools, are an issue of concern within the study area. Vernal pools provide habitat for a number of endangered, threatened, proposed, and Candidate species. These include several species of vernal pool fairy and tadpole shrimp, as well as a number of plants.

Riparian corridors, another sensitive habitat type found within the study area, are defined as those habitats bordering rivers and streams. They contain plant species that are considered mesophytic (a plant that tolerates both dry and wet conditions). These include cottonwood (*Populus* sp.), willow (*Salix* sp.), sycamore (*Platanus* sp.), and other herbaceous and woody vegetation. Riparian corridors are sensitive because of their proximity to aquatic systems. Ground disturbance in riparian corridors can lead to erosion and the subsequent increase in sedimentation that would decrease water quality in these areas and downstream. Vegetation removal within riparian corridors can also increase the adverse effects of flooding.

4.2.1.3 CHARACTERIZATION

The following section presents a characterization of habitat types and associated plant species found in the study area. Each segment within the study area is then described based on these habitat types.

Habitat Types and Associated Plant Species

Fifteen different habitat types occur within the study area. In general, habitat types were categorized based on *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986). Riverine, lacustrine, pasture, cropland, orchard/vineyard, and urban habitat types, which could not be categorized using Holland (1986), were categorized based on *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer 1988). Brief descriptions of these habitat types and associated plant species are provided below.

- ***Cropland*—**Cropland habitat is typically a monoculture; that is, a single species growing in a given space. Most croplands support annuals planted in spring and harvested during summer or fall. In many areas, second crops are commonly planted after the first are harvested (Zeiner 1988a). A major portion of the cropland in the study area is used for rice fields, which provide habitat for a different set of species, such as waterfowl, because they are flooded.
- ***Freshwater emergent wetland*—**These wetlands are characterized by erect, rooted, herbaceous hydrophytic (water-loving) vegetation. Dominant plants are generally perennials up to seven feet high (Cowardin *et al.* 1979). Freshwater emergent wetlands are flooded frequently and the plants found there must be able to tolerate an absence of oxygen (anaerobic) environment around their roots. Additional detail regarding this habitat type is provided in Sections 4.6 and 4.16, which address floodplains and wetlands, respectively.
- ***Great Valley Cottonwood Riparian Forest*—**This habitat type is a dense, broad-leaved, winter-deciduous riparian forest dominated by Fremont cottonwood (*Populus fremontii*) and Gooddings willow (*Salix gooddingii variabilis*). The understory is dense, with abundant vegetative reproduction of canopy-dominant species. California wild grape (*Vitis californica*) is the most conspicuous vine. Scattered seedlings of shade-tolerant species such as box-elder (*Acer negundo californica*) or Oregon ash (*Fraxinus latifolia*) may be found within this riparian forest, but frequent flooding prevents their reaching into the canopy (Holland 1986).
- ***Great Valley Mixed Riparian Forest*—**This habitat is a tall, dense, winter-deciduous, broad-leaved riparian forest. The tree canopy usually is fairly well closed and moderately to densely stocked with several species including box-elder, California black walnut (*Juglans californica hindsii*), western sycamore (*Platanus racemosa*), Fremont's cottonwood, Goodding's willow, red willow (*Salix laevigata*), and *Salix lasiandra*. The understory consists of these taxa plus shade-tolerant shrubs like buttonbush (*Cephalanthus occidentalis*) and Oregon ash. Several vine species are conspicuous in both tree and shrub canopies (Holland 1986).
- ***Great Valley, Valley Oak Riparian Forest*—**This habitat contains medium to tall trees that are rarely more than 100 feet tall. The habitat generally consists of broad-leaved, winter-deciduous, closed-canopy, riparian forest dominated by valley oak. Understory species include scattered Oregon ash, California black walnut and western sycamore, as well as young valley oaks. Vines are often conspicuous and quickly moving into sunny areas created by openings in the canopy. They are also scattered throughout the shady understory (Holland 1986).
- ***Lacustrine*—**Lacustrine habitats, including ponds or lakes, are inland depressions or dammed riverine channels containing standing water. They may vary from small ponds of less than two acres to large areas covering several square miles. Depth can vary from a few inches to hundreds of feet. Lacustrine habitats include permanently flooded lakes and reservoirs, intermittent lakes, and ponds (Grenfell 1988a). Ponds are the main lacustrine habitat type in the study area.
- ***Nonnative Grassland*—**A dense to sparse cover of annual grasses (plants that germinate, mature, set, seed, and die in one year) typifies this habitat type, often associated with numerous species of showy-flowered, native annual forbs ("wildflowers"), especially in years of favorable rainfall. Germination occurs with the onset of the late fall rains, growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer-fall dry season, persisting as seeds (Holland 1986).
- ***Orchard/Vineyard*—**Orchards are typically single-species, tree-dominated habitats. Depending on the tree type and pruning methods, they may be low bushy trees or taller species with a closed canopy. Both have an open understory to facilitate harvest. Vineyards are composed of single species planted in rows, usually supported on wood and wire trellises. Vines are normally intertwined in the rows but are open between rows. The ground under the vines is usually sprayed with herbicide to prevent growth of unwanted plants (Schultze 1988).

- ***Pasture*—**Pasture vegetation is a mix of annual and perennial grasses and legumes that normally provide 100-percent ground cover. The mix of grasses and legumes varies according to management practices, such as seed mixture, fertilization, soil type, irrigation practices, weed control, and livestock type on the pasture (Zeiner 1988b).
- ***Riverine*—**Riverine habitats are intermittent or continually running water, such as rivers and streams (Grenfell 1988b). Within the study area, riverine habitats vary from large rivers, such as the San Joaquin and Cosumnes rivers, to intermittent streams, such as Coon Creek.
- ***Urban*—**The structure of urban vegetation varies with the five types of vegetative structure: tree grove, street strip, shade tree/lawn, lawn, and shrub cover. Tree groves are common in city parks, greenbelts, and cemeteries. Strips of trees along streets show variation in spacing of trees, depending on the species, design and landowner preferences. Lawns are structurally the most uniform vegetation of the California urban habitat. Shrub cover is more limited in distribution than the other structural types; hedges represent a variation of the urban shrub cover type. Species composition varies with planting design and climate (McBride and Reid 1988).
- ***Valley Needlegrass Grassland*—**This habitat is a mid-height (up to two feet) grassland dominated by perennial tussock-forming needlegrass (*Stipa pulchra*). Native and introduced annuals occur between the perennials, often actually exceeding the bunchgrasses in ground cover (Holland 1986).
- ***Valley Oak Woodland*—**This habitat type is similar to Northern Oak Woodland and Blue Oak Woodland, but typically, more open, forming a grassy understory savanna rather than a closed-canopy woodland. Valley Oak (*Quercus lobata*) is usually the only tree present within this type of woodland. This winter-deciduous species is California's largest broad-leaved tree, with mature individuals reaching 50 feet to 115 feet tall. Most stands consist of trees with an open-canopy growth form. The stands seldom exceed 30 to 40 percent ground cover (Holland 1986).
- ***Valley Wildrye Grassland*—**This is a dense, sod-prairie habitat dominated by rye grass *Elymus triticoides* (Holland 1986).
- ***Vernal Pool*—**Holland (1986) categorized two types of vernal pool habitat that may occur in the study area: Northern Hardpan Vernal Pool and Northern Claypan Vernal Pool. The surveys conducted did not distinguish between these two categories and, as a result, only the category vernal pool is used in this document. Vernal pools consist of grass- or mud-bottomed swales, earth sumps, or basalt flow depression pools in unplowed grasslands (USFWS 1992) with an impermeable layer. The impermeable layer allows the pools to retain water much longer than the surrounding uplands; nonetheless, the pools are shallow enough to dry up each season. Vernal pools may fill and empty several times during the rainy season (California Wetlands Information System 2002). This habitat type is important in the Central Valley of California because only plants and animals that are adapted to this cycle of wet and dry can survive in vernal pools. A number of protected plant and animal species rely on vernal pool habitats resulting in special management consideration.

Segment Characterization

Figures 3-1 through 3-8 map the line segments and MPs. Segments A and A_1 have nine stream crossings (extending from the O'Banion Substation to north of the Elverta Substation), totaling approximately 0.9 miles of riverine and riparian habitat. Additionally, Segments A and A_1 parallel the Sutter Causeway for approximately nine miles. A total of 13.4 acres of wetland are crossed by this segment (wetlands are further described in Section 4.16). The first 1.8 miles of Segments A and A_1 crosses cropland—mostly rice fields and their associated irrigation ditches along with some scattered wetlands. The segment also crosses Gilsizer Slough from MP 1.8 to 2.0. Gilsizer Slough is an important freshwater emergent wetland, which provides suitable habitat for the giant garter snake. From MP 2.0 to 11.0, Segments A and A_1 cross cropland. At MP 11.0, the ROW encounters the north levee of the Feather River floodplain. This floodplain is approximately one-half mile wide. At least one structure (146/3) is in the Feather River State Wildlife Area that lies between the two levees. South of MP 11.5 (the south levee of the Feather River), the segments cross mostly cropland except at Coon Creek, between MPs 13.3 and 13.5, which contains some riparian habitat. Coon Creek is about 13.5 miles south of the O'Banion Substation. The next four miles cross cropland. About 17.5 miles south of the O'Banion Substation, Segments A and A_1 cross East Side Canal. From there to about MP 20.0, both of the segments cross croplands, some small freshwater emergent wetlands, and the riparian and floodplain habitats associated with Pleasant Grove Slough and Pleasant Grove Creek. Segment A continues to MP 22.4, crossing some urban and grassland habitat types.

Segments A and A_1 contain giant garter snake and California red-legged frog habitats near the O'Banion Substation and along the Sutter Bypass, (Segments A and A_1, MP 0.0 to 10.0) where wetlands and canal ditches are dispersed. There are numerous freshwater emergent wetlands, both natural and manmade. The latter includes

rice fields as well as irrigation ditches and canals. Birds were noted nesting and/or perching on the existing transmission line structures along the entire length of the segment.

Segment B is mostly residential, with some areas less developed than others. There may be vernal pool habitat along this segment. Most of the habitat types in Segment B include grasslands, urban and some valley oak woodlands. There are two stream crossings in Segment B totaling approximately 0.1 mile of riverine and riparian habitat. The segment also crosses 1.5 acres of wetlands (a more detailed description of wetlands is provided in Section 4.16 Wetlands).

The north end of Segment C (Elverta Substation to Hurley Substation) is rural residential from MP 0.0 to 5.5. There are wetlands, including vernal pools, intermixed with grassland habitat in this segment. Just south of the crossing of Interstate 80, urban habitat types become common. At approximately MP 7.5, the segment enters into the American River floodplain and continues through the floodplain for approximately 3.8 miles. Where Segment C crosses or parallels the American River floodplain, its associated vegetation includes elderberry shrubs. There is evidence of habitation by the threatened valley elderberry longhorn beetle (VELB). The floodplain of the American River, between MP 7.3 and 11.1 also contains several small freshwater emergent wetlands (see Section 4.16). There are 4.2 total miles (62.7 acres) of riparian habitat and vernal pools crossed by Segment C. There are also two drainage canal crossings in Segment C.

There are five stream crossings in Segment D (extending from the Hurley Substation to the Elk Grove Substation) totaling approximately 2.4 miles of riverine and riparian habitat. The segment also crosses 36.3 acres of wetlands (see Section 4.16 for further detail of wetlands occurring within this segment). Segment D parallels the American River for about one mile and crosses it once. The first one-quarter mile of Segment D crosses the floodplain of the American River which contains elderberry bushes in its riparian zone. The next one-half mile crosses urban habitat before recrossing the American River at the American River Parkway. The American River Parkway also contains elderberry bushes that support the Federally threatened VELB. After leaving the riparian habitat of the American River, as the segment goes further south, the land becomes more industrialized, leaving most natural communities and small highly fragmented parcels. The existing transmission line crosses urban habitat with industrial parks, landfills, and nonnative grasslands. Segment D then turns almost due south at MP 7.0, at the Hedge Substation. Once the segment passes Gerber Road at MP 8.8, the habitat becomes less urban and more rural residential, with grasslands, croplands, and widely scattered residences. For most of the remaining length of Segment D, habitat types encountered include riparian, riverine, and grassland. Segment D crosses Laguna Creek and its associated riparian area at MP 12.8, which may provide habitat for the California red-legged frog. There may also be vernal pools and more riparian habitat along Elk Grove Creek at MP 14.7.

Segments E and E_1 (extending from the Elk Grove Substation south to the Tracy Substation) begin at the Elk Grove Substation and go almost due south to MP 8.0. The transmission line route crosses several lacustrine and emergent wetlands and at least one riverine wetland. The latter is associated with the Cosumnes River. The Cosumnes River corridor, which starts at MP 2.6 (Eschinger Road) and runs to MP 6.8 (Twin Cities Road), is part of the Cosumnes River Preserve and managed jointly by the Nature Conservancy, Bureau of Land Management (BLM), the CDFG, and other agencies. This area is managed for the benefit of wildlife and native communities. The Cosumnes River floodplain contains dense riparian habitat consisting of willows and poplar trees with scattered oak trees approximately 120 yards apart on each side of the river. The existing ROW contains a 25-foot wide vegetation buffer where vegetation is limited to 12 feet high along the north and south banks of the Cosumnes River. There is the likelihood of a large giant garter snake population around Badger Creek, Segments E and E_1, MP 4.4. From about MP 10.0 to 13.0 Segments E and E_1 cross several draws and sloughs as well as the Mokelumne River and Dry Creek. These riverine systems contain important riparian habitat. Segment E_1 crosses 23 streams totaling approximately 3.1 miles of riverine and riparian habitat. This segment also crosses 47.3 acres of wetlands.

Other important wetland habitat is found from MP 24.3 to 31.0. There is a large wetland/riparian area between Pixley Slough and Bear Creek. Access was limited during surveys, but observations from the levee showed an extensive dense wetland area. The area appeared to contain several large poplar trees and valley oaks. Fourteen Mile Slough, San Joaquin River, and Stockton Deep Water Channel along with Mokelumne Slough provide riverine and riparian habitat.

At MP 31.1, Segments E and E_1 turn southwest to the Tracy Substation. Most of this portion of Segments E and E_1 traverse croplands including orchards, vineyards, row crops, and grasslands. As the transmission line approaches the Tracy Substation, the habitat includes more grassland types such as pasture and annual grasslands, as well as freshwater emergent wetlands. The agricultural areas are interspersed with ditches, drains, and watercourses. Elderberry shrubs were identified within some of these

agricultural areas beneath existing towers (MP 36.75, 40.3, and 41.5).

Segments E and E_1 cross several watercourses that provide riparian habitat. The habitat includes areas suitable for giant garter snake, red-legged frog, and vernal pool species of concern. Important riparian habitat was noted at the Cosumnes and San Joaquin river crossings, Badger, Laguna, and Dry creeks and Pixley Slough. Freshwater emergent wetlands were observed in association with the watercourses. A number of vernal pools were found in the area of the Cosumnes River Nature Preserve.

Segment F is approximately 1.5 miles long. The study area for Segment F crosses Curry Creek at approximately MP 0.3. Curry Creek contains some riparian habitat. There is one stream crossing in Segment F totaling approximately 0.1 miles of riverine and riparian habitat. One half acre of wetland is also crossed by the segment (see Section 4.16, Wetlands).

Between MP 2.0 and 4.2 of Segment G where it crosses Curry Creek, several unnamed tributaries to Curry Creek and several wetland areas associated with Curry Creek exist. These wet areas, including the streams, appear to be suitable habitat for giant garter snake and red-legged frog. Rice fields at the north end of Segment G could also provide suitable habitat for both species. Vernal pools may also be present within and adjacent to the ROW. There are two stream crossings in Segment G totaling approximately 0.2 miles of riverine and riparian habitat. Three acres of wetland are also crossed by the segment (see Section 4.16, Wetlands).

The habitat for Segment H includes areas suitable for giant garter snake, red-legged frog, and vernal pool species of concern. Segment H would also cross several unnamed drainages that flow west to the Natomas East Main Drainage Canal, and the potential exists for the introduction of fish species into these waterbodies.

4.2.2 Environmental Consequences

4.2.2.1 Standards of Significance

The Proposed Action and alternatives would have significant and adverse effect on biological resources if they:

- Adversely affect a listed endangered, threatened, or proposed plant or animal species or designated critical habitat,
- Substantially interfere with the movement of any native resident or migratory fish or wildlife species for more than one reproductive season,
- Reduce the value of habitat for fish, wildlife, or plants to an unusable level,
- Cause a native fish or wildlife population to drop below self-sustaining levels,
- Introduce or increase the spread of noxious weeds, or
- Adversely and substantially affect important riparian areas, wetlands, or other wildlife habitats.

Short-term impacts are those that last through the construction phase of a project, or one or two reproductive cycles, whichever is longer.

Long-term impacts are those that last more than two reproductive periods, or as long as the life of the transmission line depending on the organism or habitat involved.

Direct impacts are those that occur as a result of construction or operation of the transmission line.

Indirect impacts are those that occur as a result of the transmission line presence. These are usually associated with increased human accessibility to a previously inaccessible area. Because of the existing development in the Sacramento Valley, indirect impacts to biological resources would be negligible.

4.2.2.2 Environmental Protection Measures

EPMs for biological resources from Table 3-4 include the following:

- Mitigation measures developed during the consultation period under Section 7 of the ESA would be adhered to as specified in the subsequent Biological Opinion of the USFWS. In addition, mitigation developed in conjunction with state and tribal authorities would be followed.
- Before construction, all construction personnel would be instructed on the protection of cultural, paleontological, and ecological resources. To assist in this effort, the construction contract would address Federal, state, and tribal laws regarding antiquities, fossils, plants, and wildlife, including collection and removal, and the importance of these resources and the purpose and necessity of protecting them.
- Construction sites located in sensitive habitats would require a qualified biologist to conduct a site survey before clearing vegetation. The survey would identify any biologically sensitive issues such as wetlands, vernal pools, or habitat of concern. Western would use Best Management Practices to lessen disturbance.
- During construction, no equipment refueling or oil changing would be conducted within 300 feet of any waterbody or streams.
- Within riverine habitat, ROW clearing would be done by mechanical and manual methods. Construction

activities would not occur within 100 feet of the streambank.

- Vegetation would be controlled or removed in accordance with Western's *Integrated Vegetation Management Environmental Guidance Manual* (Western 1999).
- Elderberry shrubs would be avoided to the extent practical to minimize impacts to the threatened valley elderberry longhorn beetle.
- To the extent practical, freshwater emergent, lacustrine, and riverine wetlands would be spanned and vehicular traffic would not encroach within 100 feet of the boundary of these wetlands.
- To the extent practical, during the wet season, vernal pools would be driven around, spanned, or otherwise avoided.
- Reconductoring and/or replacing insulators on structures containing active raptor nests would be conducted after young birds have fledged. Inactive nests would not be removed from structures unless they pose a safety or reliability hazard.
- Human activity in the Cosumnes River Preserve during the winter months could disturb foraging behavior and adversely affect sandhill cranes. Western would coordinate construction timing in this area with the Preserve and the USFWS to the extent practical.
- Construction between the Cosumnes River and Laguna Creek could result in increased erosion and sedimentation, which may adversely affect fish species occurring in the area. Western would span these water bodies, and no construction equipment would cross via the water bodies, when water is present. In addition, sedimentation control structures would be used to prevent sediment from reaching riverine habitat.
- Hazardous materials would not be drained onto the ground, into streams, or into drainage areas. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, would be removed to a disposal facility authorized to accept such materials.
- Special-status species or other species of particular concern would be considered during post-EIS phases of project implementation in accordance with management policies set forth by the appropriate land-managing agency. This could entail conducting surveys for plant and wildlife species of concern. Where such species are identified, appropriate action would be taken to avoid adverse impacts on the species or habitat.
- At completion of work, all work areas except access trails would be scarified or left in a condition that would facilitate natural or appropriate vegetation, provide for proper drainage, and prevent erosion.

4.2.2.3 Impacts from Proposed Action—New Transmission O'Banion Substation to Elverta Substation; Realignments; Reconductoring Elverta Substation to Tracy Substation

The following section discusses those impacts anticipated to occur to critical habitat, special status species, and sensitive habitat types as a result of implementation of the Proposed Action. The Proposed Action includes work in all segments (Segments A through H).

Construction, reconductoring, and realignments may result in adverse impacts to biological resources. These impacts may include the discovery of an endangered, threatened, or critical habitat during construction or impacts to wetlands if Western was unable to span the area.

To avoid significant impacts, Western's construction and operation activities would comply with the EPMs presented in Table 3-4. Additionally, after the selection of a project, Western would prepare a Biological Assessment and survey the area as part of Section 7 consultation with the USFWS. The USFWS Section 7 consultation would evaluate the potential impacts to the Federally listed species presented in Appendix C, Table C-2. The CDFG would be consulted for state species of concern also listed in Table C-2.

If the project selected is located in San Joaquin County, Western would coordinate with Joint Powers Authority of San Joaquin County. San Joaquin County is within the area covered by the San Joaquin Multi-species Habitat Conservation Plan (MSHCP or Plan). The San Joaquin MSHCP conservation strategy relies on minimizing, avoiding, and mitigating impacts for species covered under the MSHCP, including Swainson's hawk, valley elderberry longhorn beetle, giant garter snake, burrowing owl, vernal pools, and vernal pool species.

Designated Critical Habitat

Critical habitat for the VELB is found near the transmission line between the Elverta Substation and Hurley Substation. No other critical habitat for VELB is designated within the study area.

The need to remove elderberry shrubs from the ROW and at structure locations would result in direct, adverse impacts to the threatened VELB. Replacing insulators and

rehanging the conductors would involve going to a specific structure by truck and cutting back vegetation within a 20-foot radius of the structure to allow a safe work area. Where these structures are co-located with elderberry shrubs, for instance along the American River Parkway, the VELB could be directly impacted.

Elderberry shrubs would be avoided to the extent practical to minimize impacts to the threatened VELB. If impacted, mitigation measures would be implemented in accordance with the Biological Opinion. Construction staging areas would be planned to avoid impacting elderberry shrubs. In areas where elderberry shrubs occur adjacent to construction, environmentally sensitive area fencing would be put in place under the supervision of a biological monitor.

Critical habitat for winter-run and spring-run Chinook salmon also exists in the study area within the Sacramento-San Joaquin Rivers Delta. Critical habitat for salmon is considered all tidal waters of the Delta, including the San Joaquin River and its tributaries.

Special-status Wildlife and Plant Species

Endangered or threatened wildlife and plant species associated with vernal pools may be adversely impacted by the movement of vehicles through vernal pools. Where possible, vernal pools would be avoided by requiring vehicles to drive around them, or span them during construction. Consultation with the USFWS will determine mitigation that may be required for temporary impacts to vernal pool species.

Raptor nests may be impacted during reconductoring or replacing insulators on transmission line structures. Sandhill cranes that may be present at Cosumnes River Preserve during winter migration could be affected by disturbance caused during construction.

To the extent practical, reconductoring and insulator replacement would occur outside the nesting season to avoid impacts to nesting birds, including raptors (approximately mid-February through mid-July). On towers with active raptor nests, construction would be conducted after young birds have fledged as determined by the qualified biologist. Inactive nests would not be removed from structures unless they pose a safety or reliability hazard. This work would also be scheduled to avoid winter migration of sandhill cranes at Cosumnes River Preserve, Segments E and E_1, MP 4.0 to 7.0. Construction timing in this area would be coordinated with the Preserve and the USFWS to the extent practical.

Sensitive Habitat Types

Constructing a new transmission line between the O'Banion Substation and the Elverta Substation (Segment A_1) would require the temporary disturbance of more than 419 acres and the permanent disturbance of over 54 acres of habitat. This would result in impacts to all of the habitat types discussed for Segment A_1 (Section 4.2.1.3).

Impacts to riverine and freshwater emergent wetlands may also occur with construction of a new transmission line. Temporary water crossings (timber mats, etc.) may be built to access areas between the Cosumnes River and Laguna Creek, which may unavoidably cause increased sedimentation of riverine habitat. Further discussion of wetland impacts is presented in Section 4.16.

Removal of large woody vegetation from the water's edge in riparian habitats would result in some additional solar heating of the water. Removing vegetation in the riparian zone would also result in erosion and the subsequent increase in sedimentation of the watercourse. This would reduce the value of the habitat to aquatic and semi-aquatic wildlife.

The addition of a new double-circuit transmission line in this area, parallel to the existing line, would increase the possibility of bird collisions. If collisions occur, Western would provide marking devices to minimize collisions.

Reconductoring the existing transmission line between the Elverta Substation and the Hurley Substation (Segment C) would result in the temporary disturbance of 6.6 acres. It would involve two major actions that could result in direct impacts to biological resources. These actions would be development of pulling or tensioning sites necessary for installing new conductors and replacement of insulators on each structure. Typically, a pulling site would be required in the existing ROW, approximately every two to five miles. Constructing the pulling sites would result in minor additional loss of vegetation.

Where previously cleared areas are not available, it would be necessary to clear an area of vegetation for the pulling site. These uncleared areas would include places where the pulling sites occur at turning structures. Because the conductors and overhead ground wires are pulled in a straight line, when the transmission line turns a corner, the pulling sites may occur outside the ROW. Removing vegetation in these areas would typically be a short-term impact since vegetation would grow back.

Modification or replacement of some of the existing structures would provide additional support for the new conductor. These modifications may include increasing the height of, or reinforcing the structures, or installing larger cross-arms. Any of these activities would occur in the existing ROW. The impacts would be similar to those described above for replacing insulators.

Reconductoring the existing transmission line in Segment D (from the Hurley Substation to the Elk Grove Substation) would require temporary disturbance of approximately 16 acres. The same biological impacts described for Segment C would pertain to Segment D.

Reconductoring the existing transmission line in Segment E (from the Elk Grove Substation to the Tracy Substation) would require temporary disturbance of about 43 acres. The same biological impacts described for Segments C and D would pertain to Segment E.

There are two stream crossings in Segment G (located east of the starting point of Segment F to the Cottonwood–Roseville transmission line) totaling approximately 0.2 mile of riverine and riparian habitat. Realigning approximately five miles of the Cottonwood–Roseville transmission line would require new construction resulting in nearly 90 acres of temporarily disturbed habitat and almost 12 acres of long-term habitat disturbance. Some of this habitat is considered suitable for giant garter snake, fairy shrimp, and red-legged frog.

Abandonment of a transmission line may require the movement of personnel and equipment to remove conductor and shield wire, along with the steel structures. The actions and equipment required for abandonment would be similar to construction and would cause similar impacts. Biological resources that could be affected by these actions include wetlands, including vernal pools where they occur, as well as riparian and agricultural habitats. Impacts to the agricultural habitats would be temporary and short term.

4.2.2.4 Impacts from Alternative 1—Reconductoring O'Banion Substation to Tracy Substation

The following section discusses potential impacts to critical habitat, special-status species and other sensitive habitat types resulting from implementation of Alternative 1. EPMs presented in Table 3-4 and consultation and coordination described for the Proposed Action would apply to Alternative 1. Alternative 1 consists of Segments A, B, C, D, and E (see Section 4.2.1.3). Reconductoring existing lines from the O'Banion Substation to the Tracy Substation would result in fewer impacts to biological resources than the Proposed Action. There are fewer acres of temporary disturbance and no areas of long-term disturbance. There would be no additional ROW requirements, although pulling sites may be required outside the ROW at turning structures.

Designated Critical Habitat

Critical habitat for the VELB is found near the transmission line between the Elverta Substation and Hurley Substation. Reconductoring of the transmission line would not result in any impacts to the VELB critical habitat. Critical habitat for the winter-run and spring-run Chinook salmon occurs within all tidal waters of the Delta, including the San Joaquin River and its tributaries. Reconductoring would not impact this critical habitat.

Special-status Wildlife and Plant Species

In some cases, recurrent removal of elderberry shrubs may be necessary. Implementation of the EPMs and the anticipated Section 7 consultation with USFWS would minimize the magnitude of biological resource impacts.

Reconductoring the existing transmission line would not increase the potential for bird collisions. Spacing of conductors and other equipment would minimize the likelihood of large bird electrocutions.

Sandhill cranes that may be present at Cosumnes River Preserve during winter migration could be affected by disturbance caused during construction.

Sensitive Habitat Types

The impacts would include the movement of equipment down the ROW and removal of vegetation within 20 feet of existing structures for safe workspace. Pulling and tensioning sites would also be cleared.

Depending on the type of wetland and timing of construction, movement of equipment through the wetland could result in contamination of the water or adversely affect the impermeable layer that keeps water from percolating down through the substrate. In those areas where the existing ROW contains wetlands, impacts would occur as described in Section 4.16.

Under Alternative 1, it would be necessary to modify or replace approximately 199 existing structures to provide additional support for the new conductor. These modifications may include increasing the height of, or reinforcing the structures, or installing larger crossarms. Any of these activities needed would occur in the existing ROW. This work may result in impacts to elderberry shrubs if they exist beneath any of the 199 existing structures to be modified or replaced. The impacts would be similar to those described above for the Proposed Action.

4.2.2.5 Impacts from Alternative 2—New Transmission O'Banion Substation to Elverta Substation and Realignments

The following section discusses impacts to critical habitat, special-status species, and other sensitive habitat

types resulting from implementation of Alternative 2. EPMs presented in Table 3-4 and consultation and coordination described for the Proposed Action would apply to Alternative 2. Alternative 2 includes Segments A_1, B, F, G, and H.

Designated Critical Habitat

Critical habitat for the VELB is found near the Elverta Substation. No impacts to designated critical habitat would occur under Alternative 2.

Special-status Wildlife and Plant Species

The need to remove elderberry shrubs where they occur in the ROW and at structure locations, particularly along riparian habitats, would result in an adverse impact to the VELB. The EPMs and the anticipated Section 7 consultation with USFWS would minimize the magnitude of impacts.

Building a new double-circuit, 230-kV transmission line from O'Banion Substation to Elverta Substation would require the temporary disturbance of 486 acres and the permanent disturbance of nearly 66 acres of habitat. It could result in impacts to all of the habitat types discussed in Section 4.2.1.3. Primary concern would be impacts to vernal pools. Movement of vehicles through vernal pools would result in adverse impacts to the habitat by contamination and possibly the loss of integrity of the impermeable substrate. Further discussion of potential impacts to vernal pools is provided in Section 4.16.

The addition of a new double-circuit transmission line in this area, parallel to the existing transmission line, would increase the possibility of bird collisions. The design requirements of the transmission line would minimize the potential for electrocutions of large birds.

Sensitive Habitat Types

Additional impacts to riverine and freshwater emergent wetlands are also a possibility. Removal of large woody vegetation from the water's edge in riparian habitats would result in additional solar heating of the water. Removal of vegetation in the riparian zone would result in erosion and the subsequent increase in sedimentation of the watercourse, which would adversely affect aquatic and semi-aquatic wildlife.

Although some habitat alteration would occur, there are no large tracts of forested habitat in these segments that would suffer from fragmentation if a 125-foot ROW were cleared through them.

4.2.2.6 Impacts from Alternative 3—New Transmission Elk Grove Substation To Tracy Substation

The following section discusses impacts to critical habitat, special-status species, and other sensitive habitat types resulting from implementation of Alternative 3. EPMs presented in Table 3-4 and consultation and coordination described for the Proposed Action would apply to Alternative 3. Alternative 3 consists of Segment E_1.

Designated Critical Habitat

Critical habitat for the VELB is found near the Elverta-Hurley transmission line. There is no VELB critical habitat designated within the alignment from the Elk Grove Substation to the Tracy Substation. Critical habitat for the winter-run and spring-run Chinook salmon occurs within all tidal waters of the Delta, including the San Joaquin River and its tributaries.

Where the transmission line crosses the San Joaquin River or its tributaries, measures would be taken to avoid impacts to the waterways so as to avoid impacts to the listed winter-run and spring-run Chinook salmon.

Special-status Wildlife and Plant Species

In some cases, recurrent removal of elderberry shrubs may be necessary. The EPMs and the planned Section 7 consultation are expected to minimize the magnitude of biological resource impacts.

Segment E_1 contains suitable habitat for the giant garter snake and the red-legged frog, which, if present, would be impacted (directly and indirectly) by constructing and maintaining this transmission line.

The construction of a double-circuit transmission line in this area would increase the potential for bird collisions. The stacked configuration of conductors and shield wires on the double-circuit structure would increase the number of wires to be avoided. This would be problematic at communication corridors such as at watercourses and valley crossings. The design requirements of a 230-kV transmission line would minimize the likelihood of electrocution of large birds.

Sandhill cranes that may be present at Cosumnes River Preserve during winter migration could be affected by disturbance caused during construction.

Sensitive Habitat Types

This alternative would temporarily disturb more than 850 acres and permanently disturb more than 100 acres of habitat. It could result in impacts to all habitat types discussed in the characterization of Segment E_1 (Section

4.2.1.3). Primary concern would be of impacts to the Cosumnes River Preserve. Movement of vehicles through this area could result in adverse effects to riverine and freshwater emergent wetlands by contamination. Removing large woody vegetation from the water's edge in riparian habitats would result in some additional solar heating of the water. Clearing vegetation in the riparian zone would result in erosion and the subsequent increase in sedimentation of the watercourse, which would adversely affect aquatic and semi-aquatic wildlife. Vernal pools have also been identified within the Cosumnes River Preserve in the vicinity of the transmission line (May Consulting Services October 2000).

There is a possibility for indirect long-term impacts from creating new access into the Cosumnes River Preserve through the development of access roads. While the land managers minimize entrance to the Preserve, the presence of new access roads and the movement of heavy equipment increase the likelihood that others may find an entrance to explore the area.

4.2.2.7 Impacts from the No Action Alternative

If the facilities were not developed, routine and emergency maintenance would continue to repair or replace equipment or remove vegetation, which threatens worker and public safety and transmission line reliability. As the existing facilities age, emergency maintenance of the system would probably increase.

Under the No Action Alternative, additional indirect impacts to biological resources would not occur. However, direct impacts associated with routine and emergency maintenance would continue. Activities in the ROW, including the methods used for access and maintenance, would remain.

No additional impacts to special-status species would occur beyond those described in the Programmatic Biological Opinion issued for Western's routine maintenance activities by the USFWS on May 27, 1998.

4.3 CULTURAL RESOURCES

4.3.1 Affected Environment

Cultural resources are aspects of the physical environment that relate to human culture and society and cultural institutions that hold communities together and link them to their surroundings. Cultural resources include expressions of human culture and history in the physical environment (such as prehistoric and historic sites, buildings, structures, objects, districts, and other places, including natural features) considered important to a culture, subculture, or community. Cultural resources also include traditional lifeways and practices, community values, and institutions.

Cultural resources have an important role in connecting all contemporary societies to their heritage and traditions, thereby providing structure and perspective for contemporary life. Once damaged or destroyed, these resources are essentially nonrenewable, though the tangible evidence of the past sometimes may be restored or reconstructed to some degree.

Western has prepared and distributed a Programmatic Agreement (PA) for this project to meet compliance with Section 106 of the *National Historic Preservation Act* (NHPA). The PA describes procedures to identify cultural resources within the area of potential effects. All identified cultural resources would be evaluated and treated in consultation with the parties participating in the PA.

4.3.1.1 Resource Study Area

The resource study area for assessing impacts on cultural resources was considered the "area of potential effects," as defined by regulations. The area of potential effects is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties" (36 CFR Part 800.16[d]).

The area of potential effects was considered the ROW where ground-disturbing activities could occur. This also includes the ROW for existing or new access roads.

Potential indirect effects include visual and noise intrusions that could diminish the historic values of certain cultural resources. The area of potential indirect effects is defined as extending up to 0.25 mile from any project component.

Methods used to identify the presence of cultural resources and to determine National Register of Historic Places (NRHP) eligibility vary among the cultural resource types. Pedestrian surveys are used to locate prehistoric and historic resources, and sometimes excavations or in-depth architectural recordings are required to evaluate NRHP eligibility. Archival research of written records helps identify historic resources or possible traditional cultural properties (TCPs). Consultations with interested Native American tribes or other culture groups identify TCPs and religious resources. Consultation sometimes includes meetings with traditional religious practitioners, interviews with knowledgeable individuals, and site visits to particular areas of concern.

Western completed archival research to determine if any cultural resources have been identified within the ROW or within one-quarter mile of the ROW of any of the alternatives. The research was conducted at the Califor-

nia Historical Resource Information Centers at Sonoma State University in Rohnert Park and at appropriate California state universities. In addition, Western consulted with the California Native American Heritage Commission (NAHC) on appropriate Native American contacts for the study area. In consultation with the NAHC, Western consulted with three Federally recognized tribes: the Shingle Springs Band of Miwok Indians, the Ione Band of the Miwok Indians, and the United Auburn Indian Community of the Auburn Rancheria. Contacts also included groups that have petitioned for Federal recognition status. These include the Muwekma Indian Tribe, the Miwok Indian Community of the Wilton Rancheria, and the Indian Canyon Mutsun Band of Costanoan. Consultations would determine their interest in becoming signatories to the PA and providing traditional use information. Additional information on tribal consultation for the SVS EIS is located in Appendix D.

4.3.1.2 Issues of Environmental Concern

The following laws, regulations, and Executive Orders (EOs) mandate specific cultural resource requirements or restraints that could affect the alternatives that are analyzed in the Draft EIS:

- NHPA of 1966, as amended (16 United States Code (U.S.C.) §470) and implementing regulations (36 CFR Part 800)
- *National American Graves Protection and Repatriation Act* (NAGPRA) of 1990 (25 U.S.C. §3001) and implementing regulations (43 CFR Part 10)
- *American Indian Religious Freedom Act* (AIRFA) of 1978 (42 U.S.C. §1996)
- *Archaeological Resources Protection Act* (ARPA) of 1979 (16 U.S.C. §470aa *et seq.* as amended P.L. 100-555; P.L. 100-588 and implementing regulations at 43 CFR Part 7)
- EO 13007, Indian Sacred Sites, May 24, 1996

For this Draft EIS, cultural resource information has been organized into the categories of prehistoric cultural resources, historic cultural resources, and TCPs. A cultural resource can fall into more than one category due to use through a long period or for multiple functions.

Prehistoric Cultural Resources

Prehistoric resources refer to any material remains, structures, and items used or modified by people before the establishment of a European presence in the Sacramento Valley in the early 19th century. Examples of prehistoric resources in the study area include village sites, rock shelters, rock art, water-control features, game drives or traps, aboriginal trails, campsites, and scatters of prehistoric artifacts.

Historic Cultural Resources

Historic resources include material remains and landscape alterations since the arrival of Europeans in the area. Examples in the study area include homestead, ranching, and agricultural features; water control features; mining features; historic trails, roads, and railroad features; buildings and structures in cities; Native American resources; and scatters of historic artifacts.

Traditional Cultural Properties

TCPs are places associated with the cultural practices or beliefs of a living community. These sites are rooted in the community's history or are important in maintaining cultural identity. The study area has been occupied or used for at least 4,500 years by Native American, Spanish, Mexican, and American cultures. The relationships between these cultures and their surroundings are as varied as the cultures themselves. These relationships may have resulted in the attachment of traditional, spiritual, or religious aspects to various natural and cultural features. Religious resources, such as sacred areas or places, are needed for the practice of a religion. These resources have attained a position in the religious or spiritual history and activities of the community and are a part of that particular culture's spiritual survival. Very often religious resources are also considered TCPs.

4.3.1.3 Characterization

A Class I records search was conducted at the California Historical Resources Information System at the California State University at Stanislaus, Chico, Sacramento, and Rohnert Park. Much of the study area was surveyed by Far Western Anthropological Group, Inc. (Far Western 2002) for a Western project unrelated to the Draft EIS but overlapping a large portion of this study area. Some portions of the Draft EIS segments were not surveyed due to the presence of rice fields. The following descriptions use existing data from this records search and the Far Western (2002) survey. Western contacted the California NAHC, and there are no known TCPs or sacred sites in the study area. Tribal consultations are ongoing, but no TCPs have been identified. Due to the sensitive nature of cultural resources, maps showing site-specific locations are not provided in this document. Figures 3-1 through 3-8 detail the line segments and MPs.

No prehistoric cultural resources were recorded for Segment A. Historic resources included three levees, one road, and three railroads. No TCPs were identified. The O'Banion to Elverta double-circuit transmission line

was constructed in 1962 and was not recorded as a site due to its recent date of construction. While Segment A_1 was not surveyed near the Pleasant Grove Cemetery, the proximity to Segment A would suggest similar results.

No prehistoric or historic cultural resources or TCPs were recorded for Segment B. The O'Banion to Elverta double-circuit transmission line was constructed in 1962 and was not recorded as a site due to its recent date of construction. The Cottonwood to Roseville single-circuit transmission line was constructed in 1947 as part of the CVP by the Bureau. It was recorded for the Far Western project previously described.

The inventory at Segment C identified prehistoric and historic sites. One prehistoric site is a low mound with an apparent midden (prehistoric village site). No transmission structures are within the site boundary. The second prehistoric site was previously identified as a mound, but was not found during the Far Western (2002) inventory. The five historic sites include a city dump, two roads, three levees, and four railroads. No TCPs were identified. The Elverta to Tracy transmission line was built in 1961 and was not recorded as a site due to its recent date of construction.

No prehistoric cultural resources were recorded for Segment D. Four historic cultural resources were recorded, including one levee and three railroads. No TCPs were identified. The Elverta Substation to Tracy Substation transmission line was constructed in 1961 and was not recorded as a site due to its recent date of construction.

One previously recorded prehistoric mound village site of Segment E was recorded in the area in 1937, but was not relocated during the Far Western (2002) inventory. No other cultural resources or TCPs were located. South to the Sacramento/San Joaquin county line, the records search indicated that the transmission line crosses three railroads. A prehistoric midden site is also located along the ROW, which may have transmission line structures within the site boundary. The records search also indicated numerous historic buildings in the area, but these are not close to the existing transmission line, and are outside the area of potential effects. The Elverta Substation to Tracy Substation transmission line was constructed in 1961 and was not recorded as a site due to its recent date of construction.

Segment E_1 has not been surveyed. The records search indicated, however, that south of the Sacramento/San Joaquin county line the transmission line crosses three railroads. The records search also indicated numerous historic buildings in the area, but these structures are not close to the transmission line, and are outside the area of potential effects.

No prehistoric or historic cultural resources or TCPs were identified at Segment F. The Cottonwood–Roseville transmission line was constructed in 1947 as part of the CVP for the Bureau. It was recorded for this EIS.

Segment G has not had an archaeological survey. The records search indicated a cemetery in the study area. No other cultural resources or TCPs were identified.

No prehistoric or historic cultural resources or TCPs were identified at Segment H. The Cottonwood–Roseville transmission line was constructed in 1947 as part of the CVP for the Bureau. It was recorded for this EIS.

4.3.2 Environmental Consequences

Under the Proposed Action and alternatives, significant adverse impacts to cultural resources could occur. Potential impacts as a result of constructing, reconductoring and maintaining the Proposed Action and alternatives would be similar in nature. Alternatives that include constructing new transmission lines would be more likely to have an impact than those involving reconductoring. Alternatives requiring the construction of new access roads would have the highest potential for impacts to archaeological resources. Augering new holes for transmission line structures would have the next largest impact. Where at all possible, transmission line structures and access roads would be sited to avoid known cultural resources. Pulling locations, splice points, and staging areas can be selected to avoid cultural resources. Reconductoring a transmission line that is NRHP-eligible could be an adverse effect, depending on the values making the transmission line eligible to the NRHP. Removing an existing transmission line would have potential impacts to archaeological resources from pulling or digging out transmission line structures. Therefore, structures identified for removal will be cut off at ground level rather than below ground surface. Erosion control methods can include recontouring, reseeding, and other minor surface disturbance.

Avoiding cultural resources is Western's standard practice. Other EPMs, discussed below, address many of these impacts. Other project-related impacts would be addressed through the PA.

4.3.2.1 Standards of Significance

The laws, ordinances, and regulations discussed above deal with impacts to cultural resources. In nearly every case, cultural resources must meet some set of criteria for significance before agencies direct efforts to preserve the values these resources represent. Under the NHPA and the regulations at 36 CFR Part 800, only historical or prehistoric sites, objects, or features, or architectural

resources determined "significant" by a Federal agency, need to be considered for potential impacts. Significance of any cultural resources is determined following the criteria for eligibility for nomination to the NRHP, as defined in 36 CFR Part 60.4. The NRHP criteria states:

> *"The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, building(s), structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and*
>
> *(a) That are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *(b) That are associated with the lives of persons significant in our past; or*
>
> *(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *(d) That have yielded, or may be likely to yield, information important to history or prehistory."*

If resources are determined to be eligible for listing on the NRHP, and the State Historic Preservation Officer (SHPO) agrees with the agency's determination, these resources are then considered significant, and the agency must avoid or lessen the impacts to them by the Proposed Action or alternatives. Indian tribes, state and local agencies, the public, and the Advisory Council on Historic Preservation are given opportunities to influence how those resources are treated. Sites within California eligible for the NRHP are eligible for the California Register of Historical Resources. Project-related impacts to an eligible cultural resource site that would adversely affect the values of the resource making it eligible for inclusion in the NRHP would be considered significant.

4.3.2.2 Environmental Protection Measures

Programmatic Agreement

Cultural resources would be considered during post-EIS phases of project implementation in accordance with the PA being developed in conjunction with the Draft EIS. Detailed inventories would occur once the Final EIS has been distributed and a ROD issued. Cultural resource identification would only be conducted for the selected alternative. Specific measures would be developed and implemented to avoid and minimize identified adverse impacts. These measures, or stipulations of the PA, could include project modifications to avoid adverse impacts, monitoring of construction activities, procedures for handling the discovery of cultural resources during construction, and data recovery studies. Under the PA, any unknown cultural resources or human remains discovered during the course of construction would be protected, evaluated, and treated in accordance with the PA. Western would instruct construction crews that cultural resources might be present in the study area. They would be trained to stop work near any discovery, and notify Western's regional environmental manager, who would confirm that the resource is evaluated and recorded by a professional archaeologist, as per the PA. This PA would be signed by Western, other project proponents, involved land-managing and utility oversight agencies, the California SHPO, and appropriate and interested tribes.

EPMs for cultural resources from Table 3-4 include the following:

- Before construction, all supervisory construction personnel would be instructed on the protection of cultural, paleontological, and ecological resources. To assist in this effort, the construction contract would address Federal, state, and tribal laws regarding antiquities, fossils, plants, and wildlife, including collection and removal, and the importance of these resources and the purpose and necessity of protecting them. Western would instruct that cultural resources might be present in the study area. Contractors would be trained to stop work near any discovery and notify Western's regional environmental manager, who would confirm that the resource is evaluated and avoided. Known cultural resources would be fenced and a minimum distance maintained for work disturbances.
- Cultural resources would be considered during post-EIS phases of project implementation in accordance with the programmatic agreement being developed in conjunction with the EIS. Surveys to inventory and evaluate cultural resources would be conducted.
- Where ground-disturbing activities are identified, cultural resource evaluations would be done to determine the need for field inventory. Construction activities would avoid all historic properties, or a special use permit or mitigation plan would be developed in consultation with SHPO.
- Irrigation system features, which are eligible for the NRHP, would be avoided during the siting of new transmission line structures and access roads, and most other irrigation system features would be avoided to the extent practicable in the siting of new structures and access roads.

4.3.2.3 Impacts from Proposed Action—New Transmission O'Banion Substation to Elverta Substation; Realignments; Reconductoring Elverta Substation to Tracy Substation

For the Proposed Action, the O'Banion Substation to Elverta Substation (Segment A_1 near Pleasant Grove Cemetery) has not been inventoried for cultural resources. The parallel nearby ROW for the existing transmission line was surveyed for cultural resources during the completion of a vegetation management project (Far Western 2002). Cultural resources in the study area are expected to be similar. Historic resources on the parallel ROW include: the Feather River Bypass Levee, the Feather River Levee, the Cross Canal Levee, the Sacramento Northern Railroad, the Western Pacific Railroad, Sacramento Northern Railroad, and Sorrento Road. Part of the realignment segment of the Cottonwood–Roseville line was surveyed during the Far Western (2002) inventory, and no prehistoric cultural resources were located. Historic resources include the Southern Pacific Railroad, the Union Pacific Railroad Mainline and the Cottonwood–Roseville transmission line. A cultural resources field inventory would be necessary for the O'Banion Substation to Elverta Substation ROW (Segment A_1) and Segment H. The Elverta Substation to Tracy Substation transmission line was surveyed to 34 miles north of Tracy Substation (Far Western 2002). This inventory recorded one prehistoric site, a midden village mound. One prehistoric mound village and one prehistoric mound site were not relocated during the field inventory of 2002. Historic sites included five levees identified during previous surveys, the Western Pacific Railroad, the Sacramento North Railroad, the Union Pacific Railroad, the Sacramento Valley Railroad, the California Central Traction Company Railroad, the Southern Pacific Railroad, Northgate Boulevard, and Del Paso Boulevard. In the unsurveyed southern segment, one prehistoric midden site is in the ROW. The disturbance of an eligible cultural resource would be significant; however, such disturbance is not expected once the standard practices and associated PA commitments are implemented.

Once a cultural resource inventory of this Proposed Action, including associated access roads, has been completed for the unsurveyed segment, Western would conduct a detailed evaluation of any effects to cultural resources, in accordance with the PA, which was developed for the Proposed Action and alternatives in compliance with Section 106 of the NHPA. The two recorded prehistoric sites would need to be evaluated for NRHP eligibility, and if eligible, an assessment of possible adverse project-related impacts and effects would be conducted. Through the PA, Western would negotiate a method to ensure avoidance or mitigate adverse effects.

The Proposed Action would not impact historic resources. All historic resources are in use and would be avoided by any ground-disturbing activities. The EPMs summarized in Section 4.3.2.2, including the development of a PA and the implementation of related commitments, are expected to avoid or minimize the magnitude of cultural resource impacts. Therefore, significant impacts are not expected, and mitigation is not appropriate.

4.3.2.4 Impacts from Alternative 1—Reconductoring O'Banion Substation to Tracy Substation

Except for the southernmost 34 miles in Alternative 1, the entire transmission line corridor has been inventoried for cultural resources. One recorded prehistoric site can be avoided through design. Another prehistoric midden site in the southern, unsurveyed segment would need to be evaluated for impacts and effects. At least six historic sites are in the area. The EPMs summarized in Section 4.3.2.2, including the development of a PA and the implementation of related commitments, are expected to avoid or reduce cultural resource impacts. Therefore, significant impacts are not expected.

4.3.2.5 Impacts from Alternative 2—New Transmission O'Banion Substation to Elverta Substation and Realignments

Alternative 2 would be the same as the Proposed Action from O'Banion Substation to Elverta Substation, but would not entail any work south of Elverta Substation.

The segment from O'Banion Substation to Elverta Substation (Segment A_1 near Pleasant Grove Cemetery) has not been inventoried for cultural resources. The parallel nearby ROW for the existing transmission line was surveyed, and cultural resources are expected to be similar. Historic resources on the parallel ROW include the Feather River Bypass Levee, the Feather River Levee, the Cross Canal Levee, the Sacramento Northern Railroad, the Western Pacific Railroad, Sacramento Northern Railroad, and Sorrento Road. The existing Cottonwood–Roseville transmission line was surveyed, and there are no cultural resources. The realignment of the Cottonwood–Roseville transmission line (Segment H) has not been surveyed. The Class I survey indicates the Pleasant Grove Cemetery nearby, which would be avoided through design. The EPMs summarized in Section 4.3.2.2, including the development of a PA and the implementation of related commitments, are expected to avoid or reduce cultural resource impacts. Therefore, significant impacts are not expected.

4.3.2.6 Impacts from Alternative 3—New Transmission Elk Grove Substation to Tracy Substation

The ROW for Alternative 3 has not been surveyed for cultural resources. The EPMs summarized in Section 4.3.2.2, including the development of a PA and the implementation of associated commitments, are expected to avoid or minimize the magnitude of cultural resource impacts. Therefore, significant impacts are not expected.

4.3.2.7 Impacts from the No Action Alternative

There would be no new impacts under this alternative. Impacts would be restricted to transmission line and access road maintenance. This includes periodic air and ground patrols. Repair to the transmission lines or structures could involve localized ground disturbance from heavy equipment. Vegetation removal by hand or mechanical equipment may be necessary to improve access roads or access to individual transmission line structures. The EPMs summarized in Section 4.3.2.2 are expected to avoid or minimize the magnitude of cultural resource impacts. Therefore, significant impacts are not expected.

4.4 ELECTRIC AND MAGNETIC FIELDS

4.4.1 Affected Environment

Both voltage and current are required to transmit electrical energy over a transmission line. The current, a flow of electrical charge measured in amperes, is the source of a magnetic field. The voltage represents the potential for an electrical charge to do work and is measured in volts (V) or kilovolts (kV). The voltage is the source of an electric field.

The possibility of adverse health effects from electric and magnetic fields (EMFs) exposure has increased public concern in recent years about living near high-voltage transmission lines. Both fields occur together whenever electricity flows, hence the general practice of considering both as EMF exposure. The available evidence has not established that such fields pose a significant health hazard to exposed humans. However, the same evidence does not prove there is no hazard. Therefore, in light of present uncertainty, the issues are discussed below, and Western's policy is to reduce such fields to some degree, where feasible, until the issue is better understood.

4.4.1.1 Resource Study Area

Approximately 108 miles of linear features make up the Proposed Action and alternatives study area. The study area is the transmission line ROW and any structures (buildings, other transmission lines, etc.) within 200 feet of this ROW. All transmission lines for all alternatives would be operated at 230 kV.

4.4.1.2 Issues of Environmental Concern

All transmission lines generate electric and magnetic fields. The present lines, the Proposed Action, and the alternatives would generate similar electric and magnetic fields. The effects of concern relating to EMFs follow:

The electrical effects of a transmission line can be characterized as "corona effects" and "field effects." Corona is the electrical breakdown of air into charged particles. It is caused by the electrical field at the surface of conductors. Field effects are induced currents and voltages, as well as related effects that might occur as a result of EMFs at ground level.

Corona Effects

Corona can occur on the conductors, insulators, and hardware of an energized high-voltage transmission line. Corona on conductors occurs at locations where the field has been enhanced by protrusions, such as nicks, insects, dust, or drops of water. During fair weather, the number of these sources is small, and the corona effect is insignificant. However, during wet weather, the number of these sources increases, and corona effects are much greater. Effects of corona are audible noise, radio and television interference, visible light, and photochemical reactions.

- ***Audible Noise***—Corona-generated audible noise from transmission lines is generally characterized as a crackling/hissing noise. The noise is most noticeable during wet-weather conditions. Audible noise from transmission lines is often lost in the background noise at locations beyond the edge of the ROW.
- ***Radio and Television Interference***—Corona-generated radio interference is most likely to affect the amplitude modulation (AM) broadcast band (535 to 1,705 kilohertz); frequency modulation (FM) radio is rarely affected. Only AM receivers located very near to transmission lines have the potential to be affected by radio interference. Television interference from corona effects occurs during bad weather, and is generally of concern for transmission lines with a voltage of 345 kV or more and only for receivers within about 600 feet of the line.
- ***Visible Light***—Corona is visible as a bluish glow or as bluish plumes. On the transmission lines in the area, the corona levels are so low that the corona on the conductors would be observable only under the darkest conditions with the aid of binoculars.

- ***Photochemical Reactions***—When corona is present, the air surrounding the conductors is ionized and many chemical reactions take place producing small amounts of O_3 and other oxidants. Approximately 90 percent of the oxidant is O_3, while the remaining ten percent is composed principally of NO_x. The maximum incremental ozone levels at ground level produced by corona activity on the transmission lines during bad weather would be less than 1 ppb. This level is insignificant when compared to natural levels and their fluctuations.

Field Effects

The electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, transmission structures, vegetation, buildings, vehicles, and persons. The electric field is measured in units of kV/meter (m), at a height of 1 m above ground level. Field effects can include induced currents, steady-state current shocks, spark discharge shocks, and in some cases field perception.

- ***Induced Currents***—When a conducting object, such as an ungrounded fence, vehicle, or person, is placed in an electric field, current and voltages are induced. The magnitude of the induced current depends on the electric-field strength and size and shape of the object. The induced currents and voltages represent a potential source of nuisance shocks near a high-voltage transmission line. Under Western's transmission line requirements, high-voltage transmission lines are placed high above objects to reduce the potential for nuisance shocks. In addition, permanent structures in the ROW, such as fences, gates, and metal buildings are grounded.
- ***Spark-Discharge Shocks***—If the induced voltage is sufficiently high on an ungrounded object, a spark-discharge shock would occur as contact is made with the ground. Under Western's transmission line requirements, the magnitude of the electric field would be low enough that this type of shock would occur rarely, if at all. Carrying or handling conducting objects such as irrigation pipe, under transmission lines can result in spark discharges that are a nuisance. The primary hazard with irrigation pipes or any other long objects, however, is electrical flashover from the conductors if the section of pipe is inadvertently tipped up near the conductors.
- ***Steady-State Current Shocks***—Steady-state currents are those that flow continuously after a person contacts an object, such as an ungrounded fence, and provides a path to ground for the induced current. The effects of these shocks may include involuntary movement in a person.
- ***Field Perception and Neurobehavioral Responses***—When the electric field under a transmission line is sufficiently strong, it can be perceived by hair erection on an upraised hand. At locations directly under the conductors, it is possible for some individuals to perceive the field while standing on the ground. Perception of the field does not occur at or beyond the edge of ROW.

Magnetic Field

A 60-hertz magnetic field is created in the space around transmission line conductor s by the electric current flowing in the conductors. The magnetic field is expressed in units of microteslas (μT) and in gauss or milligauss (mG) where one mG is one thousandth of a gauss (1 μT = 10 mG). The maximum magnetic fields of transmission lines are similar to the maximum magnetic fields measured near some common household appliances. The actual level of magnetic field would vary as the current on the transmission line and the distance to the line varies. There are no established limits for peak magnetic fields. A possible short-term effect associated with magnetic fields from alternating current transmission lines is induced voltages and currents in long-conducting objects such as fences and aboveground pipelines.

Health Effects

While there is considerable uncertainty about the EMF/health effects issue, the following facts have been established from the available information and have been used to establish Western's existing policies:

- Any exposure-related health risk to the exposed individual would likely be small.
- The most biologically significant types of exposures have not been established.
- Most health concerns are about the magnetic field.
- The measures employed for such field reduction can affect line safety, reliability, efficiency, and maintainability, depending on the type and extent of such measures.

No Federal regulations have established environmental limits on the strengths of fields from power lines. However, the Federal government continues to conduct and encourage research on the EMF issue.

Due to the present uncertainty, several states have opted for design-driven regulations ensuring that fields from new transmission lines are similar to those from existing

lines. Some states (Florida, Minnesota, New Jersey, New York, and Montana) have set specific environmental limits on one or both fields. These limits, however, are not based on any specific health effects. Most regulatory agencies believe that health-based limits are inappropriate at this time. They also believe that the present knowledge of the issue does not justify any retrofit of existing lines.

The State of California Department of Education enacted regulations that require minimum distances between a new school and the edge of a transmission line ROW. The setback distances are 100 feet from the edge of the transmission line ROW for 50-kV to 133-kV lines, 150 feet from the edge of the transmission line ROW for 220-kV to 230-kV lines, and 350 feet from the edge of the transmission line ROW for 500-kV to 550-kV lines. These distances were not based on specific biological evidence, but on the known fact that fields from power lines drop to near background levels at those distances. In 1993, the California Public Utilities Commission (CPUC) authorized the state's investor-owned utilities to carry out no- and low-cost EMF avoidance measures in the construction of new and upgraded utility projects. Although not investor-owned, Western does have field-reducing guidelines for designing new and upgraded transmission lines. California has no other rules governing EMF.

Before the present health-based concern developed, measures to reduce field effects from power line operations were mostly aimed at the electric field component, which can cause radio noise, audible noise, and nuisance shocks. The present focus is on the magnetic field because only it can penetrate building materials to potentially produce the types of health impacts at the root of the present concern. It is important for perspective to note that an individual in a home could be exposed for short periods to much stronger fields while using some common household appliances (NIEHS 1995, DOE 1995). Scientists have not established which types of exposures would be more biologically meaningful. High-level magnetic field exposures regularly occur in areas other than the power line environment. Examples of magnetic fields at particular distances from household appliance surface are listed in Table 4.4-1.

4.4.1.3 Characterization

The Proposed Action and alternatives would all involve 230-kV transmission lines, in various configurations: single-circuit, double-circuit, and parallel single-circuit lines. Electric and magnetic fields measured under the lines and at the edge of the ROW would vary depending upon the configuration of the circuits. Circuits placed parallel to each other tend to cancel electric and magnetic fields, thus reducing the measured fields under the lines and at the edge of the ROW. Fields and currents can be induced on nearby fences, irrigation pipes, and other metallic objects.

4.4.2 Environmental Consequences

4.4.2.1 Standards of Significance

Electric and magnetic fields would be considered significant if:

- The distance between the edge of ROW and a newly constructed school is within 150 feet, or

Table 4.4-1. Magnetic Fields from Household Appliance Surfaces

Appliance	Milligauss at 1 foot	Milligauss at 3 feet
Can Opener	7.19 to 163.02	1.3 to 6.44
Clock	0.34 to 13.18	0.03 to 0.68
Clothes Iron	1.66 to 2.93	0.25 to 0.37
Coffee Machine	0.09 to 7.30	0 to 0.61
Computer Monitor	0.20 to 134.7	0.01 to 9.37
Dishwasher	4.98 to 8.91	0.84 to 1.63
Fax Machine	0.16	0.03
Portable Fan	0.04 to 85.64	0.03 to 3.12
Range	0.60 to 35.39	0.05 to 2.83
Television	1.80 to 12.99	0.07 to 1.11

Source: L. Zaffanella, School Exposure Assessment Survey, California EMF Program, interim results, (November 1997).

National Environmental Health Science Reports

In June 1999, the National Institute of Environmental Health Sciences (NIEHS) released its report, *Health Effects From Exposure to Power-line Frequency Electric and Magnetic Fields* (NIEHS 1999). The report's Executive Summary concludes that "extremely-low-frequency electric and magnetic field (ELF-EMF) exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion (NIEHS), this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the U.S. uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or noncancer health outcomes provide sufficient evidence of a risk to currently warrant concern." Nevertheless, the report goes on to recommend some actions: "In summary, the NIEHS believes that there is weak evidence for possible health effects from ELF-EMF exposures, and until stronger evidence changes this opinion, inexpensive and safe reductions in exposure should be encouraged (Electric Power Research Institute [EPRI] 1999)."

The NIEHS report, submitted to Congress, is the culmination of a long-term commitment under the Research and Public Information Dissemination (RAPID) Project, which began with the *Energy Policy Act* of 1992. RAPID's objective was to accelerate applied EMF research with a focused program supported by matching funds from the Federal government and the private sector. The electric utility industry provided most of the private sector funds.

The most significant source for the NIEHS report was the NIEHS Working Group (The Working Group) Report, which resulted from a nine-day meeting in June 1998. The Working Group considered all literature relevant to the potential effects of power-frequency electric and magnetic fields on health, including cancers of several types, adverse pregnancy outcomes, chronic illnesses (for example, Alzheimer's disease and amyotrophic lateral sclerosis), and neurobehavioral changes (for example, depression, learning, and performance). The Working Group found limited support for a causal relationship between childhood leukemia and residential exposure to EMF, and between adult chronic lymphocyte leukemia and employment on jobs with potentially high magnetic field exposure. Based on this assessment and charged with ranking EMF according to International Agency for Research on Cancer criteria, the Working Group assigned EMF a 2B ranking, which translates to "possible human carcinogen." For all other health outcomes, the Working Group concluded that the evidence was inadequate.

Although regulatory actions are not in the purview of the NIEHS, they suggest "the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards. We also encourage technologies that lower exposures from neighborhood distribution lines provided that they do not increase other risks, such as those from accidental electrocution or fire."

Paper by Dr. Sander Greenland, "A Pooled Analysis of Magnetic Files, Wire Codes, and Childhood Leukemia:"

A paper by Dr. Sander Greenland (University of California, Los Angeles) and colleagues entitled "A Pooled Analysis of Magnetic Fields, Wire Codes, and Childhood Leukemia" (Greenland 2000) has been accepted for publication in the journal *Epidemiology*. The work was funded by NIEHS (EPRI 2000).

The authors concluded:

- An effect of magnetic fields below 0.3 μT (3 mG) is unlikely or too small to detect in epidemiological studies.
- There is suggestive evidence that an association between magnetic fields greater than 0.3 μT (3 mG) and childhood leukemia exists.
- Magnetic fields show a more constant association with childhood leukemia than wire code do.
- Future studies of EMF and childhood leukemia should focus on highly exposed populations.

Paper by Dr. Anders Ahlbom, Karolinska Institute, Sweden

A paper describing the results of a pooled analysis of magnetic fields and childhood leukemia was published in the September 2000 issue of *British Journal of Cancer*. Dr Anders Ahlbom (Karolinska Institute, Sweden) and colleagues conducted the analysis funded by the European Union (Ahlbom 2000). This pooled analysis is based on original, individual-level data unlike meta-analysis, which is based on published results-combined from previous epidemiological studies to examine whether there is an association between magnetic fields and leukemia (EPRI 2000).

The authors concluded:

- "We did not find any evidence of an increased risk of childhood leukemia at residential magnetic field levels less than 0.4 μT (4 mG). However, we did find a statistically significant relative risk estimate of two for childhood leukemia in children with residential exposure to EMF greater than 0.4 μT (4 mG) during the year before diagnosis. Less than one percent of subjects were in this highest exposure category. The results did not change following adjustment for the potential confounders. In addition, the existence of the so-called wire code paradox could not be confirmed."
- "The explanation for the elevated risk is unknown but selection bias may have accounted for some of the increase."

Report by the Department of Health Services, State of California, "A*n Evaluation of the Possible Risks from Electric and Magnetic Fields from Power Lines, Internal Wiring, Electrical Occupations, and Appliances*"

In response to a requirement of the California Public Utilities Commission (CPUC), the California Department of Health Services (DHS) initiated research on the possible health effects of electric and magnetic fields created by the use of electricity. While the report does not include recommendations on how to protect against the identified health risks, it does recommend further research.

The final report, dated June, 2002 asked three DHS scientists to review studies to examine the potential biological and health effects resulting from EMF exposure. The following conclusions were made:

- To one degree or another, all three of the DHS scientists are inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's Disease, and miscarriage.
- They strongly believe that EMFs do not increase the risk of birth defects, or low birth weight.
- They strongly believe that EMFs are not universal carcinogens, since there are a number of cancer types that are not associated with EMF exposure.
- To one degree or another they are inclined to believe that EMFs do not cause an increased risk of breast cancer, heart disease, Alzheimer's Disease, depression, or symptoms attributed by some to sensitivity to EMFs.
- All three scientists had judgments that were "close to the dividing line between believing and not believing" that EMFs cause some degree of increased risk of suicide.
- For adult leukemia, two of the scientists are "close to the dividing line between believing or not believing" and one was "prone to believe" that EMFs cause some degree of increased risk.

magnetic fields are in excess of 22 MG (the average value of the magnetic field of a 230-kV single-circuit line at 150 feet is 15 mG.)

- EMF avoidance practices are not conducted in the design and operation of the transmission line.

4.4.2.2 Environmental Protection Measures

One EPM for electric and magnetic fields was listed in Table 3-4. It states that Western will respond to complaints of radio or television interference generated by the transmission line and take appropriate actions.

4.4.2.3 Impacts from Proposed Action—New Transmission O'Banion Substation to Elverta Substation; Realignments; Reconductoring Elverta Substation to Tracy Substation

Western follows Federal and state regulations for designing, constructing, maintaining, and operating its transmission lines. Impacts associated with the Proposed Action and alternatives would be relatively the same. Table 4.4-2 presents the maximum design values for electrical and magnetic fields for the Proposed Action and alternatives. A discussion of the impacts from electric and magnetic field effects is presented below:

- ***Audible Noise***—There are no design-specific Federal regulations to limit the audible noise from transmission lines. There are no noise codes applicable to transmission lines in California. Audible

Table 4.4-2. Electric and Magnetic Fields from the Proposed Action and Alternatives

Configuration	Electric, Magnetic Field at Centerline	Electric, Magnetic Field, Edge of ROW	Electric, Magnetic Field, 200 Feet from Centerline
Proposed Action. Double circuit, Elverta Substation to Tracy Substation	1.0 kV/m, 160 mG	0.53 kV/m 50 mG	0.03 kV/m, 2 mG
Proposed Action. Double circuit parallel to the existing double circuit line, O'Banion Substation to Elverta Substation	1.7 kV/m, 202 mG	0.56 kV/m 50 mG	0.03 kV/m, 2.5 mG
Proposed Action. Single circuit between Cottonwood Roseville	1.9 kV/m, 180 mG	0.96 kV/m 80 mG	0.07 kV/m, 9 mG
Alternative 1. Double circuit parallel to the existing double circuit line, O'Banion Substation to Elverta Substation	1.7 kV/m, 202 mG	0.56 kV/m 50 mG	0.03 kV/m, 2.5 mG
Alternative 1. Double circuit line Elverta Substation to Hurley Substation	1.0 kV/m, 160 mG	0.53 kV/m 50 mG	0.03 kV/m, 2 mG
Alternative 2. Double circuit parallel to the existing double circuit line, O'Banion Substation to Elverta Substation	1.7 kV/m, 202 mG	0.56 kV/m 50 mG	0.03 kV/m, 2.5 mG
Alternative 2. Single circuit between Cottonwood and Roseville	1.9 kV/m, 180 mG	0.96 kV/m 80 mG	0.07 kV/m, 9 mG
Alternative 3. Double circuit Elk Grove Substation to Tracy Substation parallel to existing *double and single* circuit	1.7 kV/m, 202 mG	0.56 kV/m 50 mG	0.03 kV/m, 2.5 mG
No Action	1.9 kV/m, 180 mG	0.96 kV/m 80 mG	0.07 kV/m, 9 mG

Source: Original 2002
kV/m: kilovolt per meter
mG: milligauss

noise from transmission lines associated with the Proposed Action is limited instead through design and maintenance standards established from industry research and experience as effective without significant impacts on line safety, efficiency, maintainability, and reliability.

The noise level depends on the strength of the line electric field. The potential for occurrence can be assessed from estimates of the field strengths expected during operation. Such noise is usually generated during wet weather and from lines 345 kV or higher. Research by EPRI (1982) has validated this by showing the fair weather audible noise from modern transmission lines of less than 500 kV to be indistinguishable from background noise at the edge of a 100-foot ROW.

For the Proposed Action, low-corona design would minimize the potential for corona-related audible noise. This means upgraded, modified, and new transmission lines would add a small incremental noise level to existing background noise levels.

- ***Radio and Television Interference***—Transmission line-related radio frequency interference is an indirect effect of line operation produced by the physical interactions of line electric fields. The level of interference usually depends on the magnitude of the electric fields involved. The potential for such interference is usually only of concern for lines of 345 kV and above and not the 230-kV lines associated with this Proposed Action and alternatives. The lines would be constructed according to Western's standards, which minimize the potential for surface irregularities (nicks and scratches on the conduc-

tor), sharp edges on suspension hardware, and other irregularities.

However, if such interference occurred, Western would implement practices to eliminate it such as by appropriate line maintenance and antenna modification.

- ***Visible Light***—On the transmission lines for the Proposed Action, the corona would be similar to those on existing lines. The visible corona on the conductors would be seen only under the darkest conditions with the aid of binoculars, and would not be significant.
- ***Photochemical Reactions***—The maximum incremental O_3 levels at ground level produced by corona activity on the new and upgraded transmission lines for the Proposed Action and alternatives would be similar to that produced by existing lines in the area. During rain or fog, O_3 produced would be less than 1 ppb. This level is insignificant when compared to natural levels and their fluctuations.
- ***Induced Currents***—The magnitude of the induced currents depends on the electric field strength and size, and shape of the object. Under Western's transmission line requirements, high-voltage transmission lines are placed high above objects to reduce the potential for these shocks. In addition, permanent structures in the ROW, such as fences, gates, and metal buildings, would be grounded. Induced currents are insignificant for the Proposed Action.
- ***Steady-State Current Shocks***—Features reducing the level of potential for induced current in objects near the transmission line also reduce the level of possible induced current shock. The Proposed Action would be constructed according to Western's requirements to prevent hazardous shocks from direct or indirect human contact with overhead, energized line. Therefore, these lines are not expected to pose any such hazards to humans.
- ***Spark-Discharge Shocks***—Under Western's transmission line requirements, the magnitude of the electric field would be low enough that this type of shock would occur rarely, if at all. Under current Western practice, the potential for nuisance shocks would be minimized through standard grounding procedures. Ensuring adequate ground clearance would minimize the potential for the electrical charging.
- ***Field Perception and Neurobehavioral Responses***—Perception of the field associated with the new and upgraded lines for the Proposed Action would not be detected beyond the edge of the ROW. Persons working under the ROW (for example, farmers) might feel the field. Studies of short-term exposure to electric fields have shown that some people may perceive fields (such as felt movement of arm hair) at levels of about 2-to10-kV/m, but studies of controlled, short-term exposures to even higher levels in laboratory studies have shown no adverse effects on normal physiology, mood, or ability to perform tasks. The International Commission on Non Ionizing Radiation Protection (ICNIRP 1990) guidelines propose that short-term exposures be limited to 10-kV/m for the general public. This level could occur directly below the proposed transmission line but would decrease with distance from the centerline.
- ***Magnetic Fields***—The maximum magnetic fields of the transmission lines for the Proposed Action would be comparable with the maximum magnetic fields measured near some common household appliances (NIEHS 1995, DOE 1995). The actual level of magnetic field would vary as the current on the transmission line varies and as the height of the line above ground varies. There are no established limits for peak magnetic fields.

Transmission lines in Segment D pass within 150 feet of an existing school. Land use criteria require new schools to be located at least 150 feet from transmission lines. Magnetic fields at the school would be less than those upon which the State of California bases the 150 feet distance requirement for 230-kV lines, which is approximately 22 mG. At this location, the magnetic field would be 15 mG.

4.4.2.4 Impacts from Alternative 1—Reconductoring O'Banion Substation to Tracy Substation

The impacts of Alternative 1 on emissions of EMF effects would be similar to those described for the Proposed Action. Impacts from Alternative 1 are not expected to be adverse and significant.

4.4.2.5 Impacts from Alternative 2—New Transmission O'Banion Substation to Elverta Substation and Realignments

The impacts of Alternative 2 on emissions of EMF effects would be similar to those described for the Proposed Action. Impacts from Alternative 2 are not expected to be adverse and significant.

4.4.2.6 Impacts from Alternative 3—New Transmission Elk Grove Substation to Tracy Substation

The impacts of Alternative 3 on emissions of EMF effects would be similar to those described for the Proposed Action. Impacts from Alternative 3 are not expected to be adverse and significant.

4.4.2.7 Impacts from the No Action Alternative

Under the No Action Alternative, power shortages would be more frequent than shortages under the Proposed Action and action alternatives. No change to existing conditions would be expected.

4.5 ENVIRONMENTAL JUSTICE

4.5.1 Affected Environment

This section assesses the potential for environmental justice impacts that would result from the implementation of the Proposed Action and alternatives.

Executive Order 12898, "Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations," provides that "each Federal agency shall make achieving EJ part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of its programs, policies, and activities on minority and low-income populations and Indian tribes." The EO requires the EPA and all other Federal agencies, as well as state agencies receiving Federal funds, to develop standards to address this issue. The CEQ has oversight of the Federal government's compliance with EO 12898 and NEPA. The CEQ has developed implementation guidance for EJ under NEPA, dated December 10, 1997.

4.5.1.1 Resource Study Area

The EJ study area consists of Sutter, Placer, Sacramento, San Joaquin, Contra Costa, and Alameda counties (Segments A through H). The area of consideration includes both urban and rural areas, including the Sacramento metropolitan area. The Proposed Action, Alternative 1, and No Action ROWs would pass through the City of Sacramento.

4.5.1.2 Issues of Environmental Concern

Environmental justice considerations focus on the potential for disproportionate impacts resulting from Federal activities on minority populations, low-income communities, and tribes. Specifically, EJ issues include such things as the potential physical displacement of populations and employment and income impacts. Other issues may include the potential for adverse impacts on community institutions and organizations, reductions in access to public services, traditional and religious practices, and forms of land use, and community cultural character. Impacts related to these issues could occur temporarily during construction and for the long term after construction.

Participation in the project by Indian tribes and other potentially affected minorities and the effects of potential rate increases were issues identified during the public scoping process. Rate increases might affect low-income populations more than others. While rate increases are not included in the Proposed Action and alternatives, they could occur as a result of the added cost of improving Western's transmission system.

4.5.1.3 Characterization

The majority of the transmission line ROWs included in the Proposed Action and alternatives is in rural areas, except for portions of the Proposed Action and Alternative 1 and the No Action Alternative that would pass through Sacramento in an existing transmission ROW. Segment B from MP 4.0 to the Elverta Substation and Segment C from the Elverta Substation to MP 3.5 are adjacent to Rio Linda. Segment C from MP 3.5 to the Hurley Substation passes through the City of Sacramento. Segment D from the Hurley Substation to the Hedge Substation is within Sacramento. Segment D between MP 13.0 to 15.0 is adjacent to Elk Grove. Otherwise, residences and farms are scattered along the length of the line.

Minority and low-income populations are found in each county in the study area. Among these counties, San Joaquin and Sacramento counties have the highest percentages of residents below the poverty line (18.8 and 17.2 percent, respectively) and have Hispanic populations that are 30.5 and 16.0 percent of their respective total populations.

4.5.2 Environmental Consequences

4.5.2.1 Standards of Significance

As noted in Section 4.5.1.1 above, EO 12898 guides EJ analyses. The CEQ has also issued guidance on compliance with EO 12898 (*Environmental Justice: Guidance Under the National Environmental Policy Act,* 1997). Based on this guidance, Western has coordinated the assessment of potential EJ impacts with air quality, cultural resources, electromagnetic fields, health and safety, noise impact assessments, and socioeconomics (see Sections, 4.1, 4.3, 4.4, 4.8, 4.10, and 4.12 respectively). The EJ analysis has determined how the types of impacts addressed in these other sections could disproportionately affect low-income and minority populations. Minority and low-income populations would incur significant and adverse impacts if they experience a disproportionate share of the adverse effects caused by the Proposed Action or alternatives.

4.5.2.2 Environmental Protection Measures

EPMs described in the air quality, cultural resources, electromagnetic fields, health and safety, noise impact assessments, and socioeconomic sections would also help minimize and avoid adverse impacts to minority and low-income populations (see Sections, 4.1, 4.3, 4.4, 4.8, 4.10, and 4.12

respectively). These EPMs include consultation with potentially affected Native Americans. On this project, and as further described in Section 4.3, Western consulted with the California NAHC and three Federally recognized tribes: the Shingle Springs Band of Miwok Indians, the Ione Band of the Miwok Indians, and the United Auburn Indian Community of the Auburn Rancheria. Contact was also made with groups who have petitioned for Federal recognition status. These include the Muwekma Indian Tribe, the Miwok Indian Community of the Wilton Rancheria and the Indian Canyon Mutsun Band of Costanoan. Consultation helps avoid and minimize adverse impacts to Native Americans by better defining their concerns, locations of TCPs, and cultural practices that could be affected by the Proposed Action and alternatives.

4.5.2.3 Impacts from Proposed Action—New Transmission O'Banion Substation to Elverta Substation; Realignments; Reconductoring Elverta Substation to Tracy Substation

Most of the Proposed Action would be constructed in existing ROW, and the portion that would require new ROW (Segments A_1 and G) would mostly be next to existing ROW. It would be carefully sited to avoid any displacement of nearby rural residences or businesses. Therefore, no minority or low-income populations would be displaced and the Proposed Action would not divide the communities they live in. Construction could cause minor adverse impacts, such as traffic diversions at detours, or adverse air quality and noise impacts near the routes construction trucks would travel, or where construction equipment is used. Minority or low-income landowners could experience negative impacts if their land is needed for part of the new ROW included in the Proposed Action; however, most affected land is undeveloped or agricultural. No businesses or residences would be displaced. The acquisition of land for new ROW is not expected to cause significant or disproportionate impacts to minority and low-income populations.

Other low-income or minority individuals could experience positive employment and income impacts if hired as part of a construction crew needed to work on the Proposed Action. The Proposed Action would improve the reliability of power supplies in the areas served by the related transmission lines, which could help avoid adverse employment and income impacts during power shortages.

Western's EPMs include siting facilities to avoid TCPs and other cultural sites important to Native Americans. These practices and compliance with the cultural resources PA during post-EIS phases of Proposed Action implementation would help avoid and minimize adverse impacts to Native Americans.

Cultural resources, EMFs, health and safety, and socioeconomics analyses (Sections 4.3, 4.4, 4.8 and 4.12, respectively) all defined potential impacts on minority and low-income populations. However, given Western's EPMs, and the nature and location of the Proposed Action, none of these impacts is expected to be significant. Minority and low-income populations are not expected to be disproportionately impacted.

4.5.2.4 Impacts from Alternative 1—Reconductoring O'Banion Substation to Tracy Substation

The impacts of Alternative 1 on minority and low-income populations would be similar to those described for the Proposed Action. No new ROW would be required. Minority and low-income populations are not expected to be disproportionately impacted.

4.5.2.5 Impacts from Alternative 2—New Transmission O'Banion Substation to Elverta Substation and Realignments

The impacts of Alternative 2 on minority and low-income populations would be similar to those described for the Proposed Action. Minority and low-income populations are not expected to be disproportionately impacted.

4.5.2.6 Impacts from Alternative 3—New Transmission Elk Grove Substation to Tracy Substation

The impacts of Alternative 3 on minority and low-income populations would be similar to those described for the Proposed Action. Minority and low-income populations are not expected to be disproportionately impacted.

4.5.2.7 Impacts from the No Action Alternative

Under the No Action Alternative, power shortages may be more frequent than shortages under the Proposed Action and action alternatives. Power shortages can have a disproportionate impact on low-income and minority workers with hourly wages, as opposed to salaries, who work for manufacturing and other businesses especially affected by disruptions in power service.

4.6 FLOODPLAINS

4.6.1 Affected Environment

This section describes existing floodplain conditions within the study area and how the Proposed Action and alternatives would affect floodplains. Floodplains perform the natural, vital function of conveying and dissipating the volume and energy of peak, surface runoff flows downstream. Periodic flood flows form and sustain specific habitat types (such as wetland and riparian areas) within the floodplains (see

Sections 4.2 and 4.16 for discussion of habitat types). Environmental regulations have been developed to preserve unimpaired flood flows through established floodplains, prevent flood-related damage to downstream resources, and protect unique habitat types and species.

Activities affecting floodplains, and Waters of the United States typically found in floodplains, are regulated under Section 404 of the *Clean Water Act* (CWA) (33 U.S.C. §1251, *et seq.*) and EO 11988, Floodplain Management (42 *Federal Register* [FR] 26951, May 24, 1977). DOE has established policy and procedures in 10 CFR Part 1022 to ensure that DOE activities in floodplains comply with the EO requirements. This section incorporates the required information to comply with 10 CFR Part 1022. The Final EIS would provide a statement of findings explaining why specific activities would be located in the floodplain, what alternatives were considered, and the steps to be taken to minimize unavoidable impacts to the floodplain.

4.6.1.1 Resource Study Area

The study area includes floodplain portions of the Sutter Bypass, the Feather, American, Cosumnes, Mokelumne, and San Joaquin rivers, and associated smaller tributary floodplains crossed by or along the existing, Proposed Action, and alternative transmission ROW alignments.

Floodplains within the study area were determined by reviewing the Federal Emergency Management Agency (FEMA) maps of delineated floodplains. Floodplains for the larger tributaries are constrained by levees to prevent extensive overbank flooding and convey peak flows downstream. In some locations the levees have been set back, expanding the area available to flooding to reinstate a more natural local flood regime. The levee setback areas increase the likelihood of interaction with floodplain resources.

4.6.1.2 Issues of Environmental Concern

Issues of concern are the potential for the structure footings and access roads to alter or impair the ability of floodplains to convey flood flows. Facilities and construction activities could obstruct flows or decrease bank stability, increasing erosion. Reduced floodplain capacity may adversely impact lives and property downstream, as well as a wide variety of natural resources. There are two types of floodplains in the study area: 1) the 100-year floodplain has a 1-percent chance of flooding in any given year, and 2) the 500-year floodplain has a 0.2 percent chance of flooding in any given year. This likelihood of occurrence is based on historic hydrology; future flood flows may be more or less frequent.

4.6.1.3 Characterization

A large portion of the study area is located within the broad, combined floodplain of the major waterways listed above. Line Segments A through H, including A_1 and E_1, cross through the 100- and 500-year floodplains of the various surface watercourses between O'Banion Substation and Tracy Substation.

Figure 4-2 shows where segment alignments intersect various floodplains. Table 4.6-1 summarizes study area ROW/floodplain intersections by line segment.

Table 4.6-1. Summary of Floodplains by Line Segment

Line Segment	Total Segment Length (in miles)	Miles/Acres Within 100-yr Floodplain	Miles/Acres Within 500-yr Floodplain	Miles/Acres Outside 500-yr Floodplain
A / A_1	22.4	17.0/258.0	3.4/53.0	2.0/3.0
B	4.2	0.3/4.5	-	3.9/59.1
C	11.2	3.7/56.0	-	7.5/113.6
D	15.2	6.0/91.0	-	9.2/139.4
E / E_1	46.2	19.8/300.0	25.0/379.0	1.4/21.2
F	1.4	0.3/3.8	-	1.1/16.7
G	5.0	0.4/6.1	-	4.6/69.7
H	2.2	-	-	2.2/33.3
Proposed Action	107.8	47.5	28.4	31.9
Alternative 1	99.2	46.8	28.4	24.0
Alternative 2	35.2	18	3.4	13.8
Alternative 3	46.2	19.8	25.0	1.4

Source: Original September 2002

Figures 3-1 through 3-8 show additional detail of the segment and milepost locations.

Segments A and A_1 cross approximately 17 miles (258 acres) of the 100-year floodplain. These 17 miles include 9.3 miles along the east side of Sutter Bypass (MP 0.0 to 9.3), 1.3 miles crossing the Feather River floodplain (MP 10.5 to 11.8), and 6.4 miles in the lesser floodplains of Burkham Slough (MP 15.0 to 16.3), Cross Canal, the east side of Pleasant Grove Creek Canal, Pleasant Grove Creek, and Curry Creek at MP 17.3 to 22.4. The segment crosses the 500-year floodplain of Sutter Bypass and the Feather River for 3.4 miles (53 acres) at MP 9.3 to 10.5 and MP 11.8 to 14.0. Two miles of this alignment (MP 14.0 to 15.0 and MP 16.3 to 17.3) are outside the 500-year floodplain.

Segment B is outside the 500-year floodplain, except for three minor tributary crossings of 0.1 miles each within the 100-year floodplain at MP 0.7, 3.5, and 3.9, respectively (4.5 acres total).

Segment C is outside the 500-year floodplain from MP 0.0 to 7.5. The segment alignment falls within the 100-year floodplain for approximately 3.7 miles (56 acres) along the north bank of the American River from MP 7.5 to 11.2.

Segment D crosses about six miles (91 acres) of the 100-year floodplain, including 4.4 miles along the north bank of the American River. The ROW parallels, then crosses the American River floodplain from MP 0.0 to 4.4. The other 1.6 miles are minor tributary crossings at MP 5.6 to 6.6, 7.8, 13.8, and 15.7. The remaining portions of this segment from MP 4.4 to15.2 fall outside the 500-year floodplain.

Segments E and E_1 cross about 19.8 miles (300 acres) of 100-year floodplain, mostly (12.2 miles) in the eastern floodplain of the Cosumnes River and northern and southern floodplains of the Mokelumne River at MP 1.0 to 6.8, MP 7.3 to 12.7, MP 12.8 to 13.0, and MP 13.3 to 14.0. The ROW crosses a small 100-year floodplain drainage at MP 17.4 to 17.8 and reenters the 100-year floodplain at Pixley Slough, MP 24.0 to 24.7, then crosses a minor drainage at MP 25.1 to 25.3. The ROW continues through the floodplains of Five Mile Slough and the San Joaquin River from MP 26.1 to 30.5, the Middle River (MP 37.0 to 38.0), the Old River (MP 43.3 to 43.8), and the Delta-Mendota Canal (MP 44.4 to 44.8). The segment crosses approximately 25 miles (379 acres) of the 500-year floodplain of the various watercourses at MP 12.8, MP 13.0 to 13.3, and MP 14.0 to 17.4, MP 17.8 to 24.0, MP 24.6 to 25.1, MP 25.3 to 26.1, MP 30.5 to 37.0, MP 38.0 to 43.3, MP 43.8 to 44.5, and MP 44.8 to 46.2. The only areas outside the 500-year floodplain are at MP 0.0 to 1.0 and MP 6.8 to 7.2.

Segment F crosses approximately 0.3 miles (3.8 acres) of the Curry Creek 100-year floodplain at MP 0.3 to 0.5. The remaining 1.1 miles are outside the 500-year floodplain.

Segment G crosses approximately 0.4 miles (6.1 acres) of the 100-year floodplain, including two Curry Creek tributaries and one minor drainage at MP 2.0, MP 2.8, and MP 4.4, respectively. The remaining 4.6 miles are outside the 500-year floodplain.

Segment H (2.2 miles) is entirely outside the 500-year floodplain.

4.6.2 Environmental Consequences

The Proposed Action and alternatives would impact floodplains during and following construction of new access roads, structures, and temporary work sites within existing and new ROWs. Activities that result in additional fill within the floodplain or block water movement through the floodplain could reduce its capacity to dissipate the energy and volume of peak flows.

4.6.2.1 Standards of Significance

The effects of the Proposed Action and alternatives would be considered significant if floodplains were substantially altered. The capacity of the watercourse to convey peak seasonal flows would be reduced, thereby increasing the stage and extent of a flood. Such a situation could cause an increase in risks to life, property, and downstream resources.

4.6.2.2 Environmental Protection Measures

EPMs for floodplains from Table 3-4 include the following:

- Hazardous materials would not be drained onto the ground, into streams, or into drainage areas. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, would be removed to a disposal facility authorized to accept such materials.
- Irrigation system features, which are eligible for the NRHP, would be avoided during the siting of new transmission line structures and access roads, and most other irrigation system features would be avoided to the extent practicable in the siting of new structures and access roads.
- In construction areas (for example, material storage yards, structure sites, and spur roads from existing access roads) where ground disturbance is substantial or where recontouring is required, surface restoration would occur.
- Access roads would be built at right angles to the streams and washes to the extent practicable. Culverts would be

installed where needed. All construction activities would be conducted to minimize disturbance to vegetation and drainage channels.

- Excavated material or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm water runoff or can encroach, in any way, upon the watercourse.
- Nonbiodegradable debris would not be deposited in the ROW. Slash and other biodegradable debris would be left in place or disposed.
- All soil excavated for structure foundations would be backfilled and tamped around the foundations, and used to provide positive drainage around the structure foundations. Excavated soil excess to these needs would be removed from the site and disposed of appropriately.
- To the extent possible, new structures and access roads would be sited out of floodplains. Due to the abundance of floodplains and surface water resources in the study area, complete avoidance may not be possible, and Western will consult with the USACE.
- Culverts would be installed where needed to avoid surface water impacts during construction of transmission line structures. All construction activities would be conducted in a manner to avoid impacts to water flow.

4.6.2.3 Impacts from Proposed Action—New Transmission O'Banion Substation to Elverta Substation; Realignments; Reconductoring Elverta Substation to Tracy Substation

Forty-seven miles of the Proposed Action occur within the 100-year floodplain. Within these 47 miles, approximately 163 new transmission line structures (99 for new construction, 64 for reconductoring) would be constructed along the new and existing ROW. These activities would disturb approximately 38 acres of the 100-year floodplain temporarily and 16 acres long term.

Another 29 miles of the Proposed Action occur within the 500-year floodplain. Within these 29 miles, 20 new structures would be constructed and 61 structures would be replaced during reconductoring. This would cause 19 acres of temporary disturbance and 8 acres of long-term disturbance to the 500-year floodplain.

Most impacts would be temporary and all would be less than significant when the EPMs are implemented (Table 3-4). The only long-term impacts would result from installing concrete footers and contouring for positive drainage at new transmission line structures. The expanse of available floodplain within and surrounding the area would completely absorb any change resulting from such modifications. These negligible changes to the 100- and 500-year floodplain would not individually or cumulatively alter the capacity of the floodplain to convey and dissipate the volume and energy of peak flows. Therefore, the stage and extent of a flood would not be increased.

4.6.2.4 Impacts from Alternative 1—Reconductoring O'Banion Substation to Tracy Substation

Forty-seven miles of Alternative 1 occur within the 100-year floodplain. Within these 46 miles, approximately 89 new transmission line structures would be constructed during reconductoring along the existing ROW. These activities would disturb approximately 20 acres of the 100-year floodplain temporarily and nine acres long term.

An additional 28 miles of the Alternative 1 alignment occur within the 500-year floodplain. Within these 28 miles, approximately 66 structures would be replaced during reconductoring. Resulting impacts to the 500-year floodplain would total approximately 15 acres of temporary disturbance and seven acres of long-term disturbance.

Floodplain impacts would be similar to those discussed for the Proposed Action. These negligible changes to the 100- and 500-year floodplain would not individually or cumulatively alter the capacity of the floodplain to convey and dissipate the volume and energy of peak flows. Therefore, the stage and extent of a flood would not be increased.

4.6.2.5 Impacts from Alternative 2—New Transmission O'Banion Substation to Elverta Substation and Realignments

Eighteen miles of Alternative 2 lie within the 100-year floodplain. Within these 18 miles, approximately 99 new transmission line structures would be constructed along the new and existing ROW. These activities would disturb approximately 23 acres of the 100-year floodplain temporarily and 10 acres long term.

An additional 3.4 miles of Alternative 2 alignment occur within the 500-year floodplain. Within these 3.4 miles, 20 new structures would be constructed. Resulting impacts to the 500-year floodplain would total approximately 4.5 acres of temporary disturbance and two acres of long-term disturbance.

Floodplain impacts would be similar to those discussed for the Proposed Action. These negligible changes to the 100- and 500-year floodplain would not individually or cumulatively alter the capacity of the floodplain to

convey and dissipate the volume and energy of peak flows. Therefore, the stage and extent of a flood would not be increased.

4.6.2.6 Impacts from Alternative 3—New Transmission Elk Grove Substation to Tracy Substation

Twenty miles of Alternative 3 alignment occur within the 100-year floodplain. Within these 20 miles, approximately 96 new transmission line structures would be constructed along the new and existing ROW. These activities would disturb approximately 22 acres of the 100-year floodplain temporarily and 10 acres long term.

An additional 25 miles of the Alternative 3 alignment occur within the 500-year floodplain. Within these 25 miles, approximately 225 new structures would be constructed along the new ROW. Resulting impacts to the 500-year floodplain would total approximately 52 acres of temporary disturbance and 24 acres of long-term disturbance.

Floodplain impacts would be similar to those discussed for the Proposed Action. These negligible changes to the 100- and 500-year floodplain would not individually or cumulatively alter the capacity of the floodplain to convey and dissipate the volume and energy of peak flows. Therefore, the stage and extent of a flood would not be increased.

4.6.2.7 Impacts from the No Action Alternative

Without the Proposed Action or action alternatives, no changes to existing facilities or alignment would occur and no new impacts to the active floodplain would be expected. Normal operation and maintenance, repairs, and emergency management of the system would continue as in the past. There are recognized temporary and insignificant impacts from maintaining access and transmission service (for example, vegetation management within the ROW). These impacts would continue as before and be avoided, minimized, or mitigated to the extent possible using Western's established EPMs (Table 3-4).

4.7 GEOLOGY

4.7.1 Affected Environment

This section describes the existing geologic and hydrogeologic conditions and impacts from the implementation of the Proposed Action and alternatives. Geology includes discussions on grading, erosion, mining, and seismicity.

4.7.1.1 Resource Study Area

The focus of the study for geologic constraints and hazards is the transmission line ROW and nearby geologic faults including the Willows, Midland, Stockton, and Midway faults that could potentially affect the transmission lines.

4.7.1.2 Issues of Environmental Concern

Issues of environmental concern for geological resources include erosion, subsidence, landslides, and seismic and related hazards (liquefaction). They are discussed in the following section.

4.7.1.3 Characterization

Regional Setting

The study area lies within the Central Valley of California, a broad depositional basin between the Sierra Nevada Mountains on the east and the Coast Mountain Range on the west. The Central Valley is about 400 miles long by 50 miles wide and covers approximately 20,000 square miles. It contains the Sacramento Valley and the San Joaquin Valley. The surface elevation of the Central Valley lowland rises from slightly below sea level to about 400 feet above sea level at its north and south ends. The valley is unusual for a lowland area because it is a relatively undeformed basin surrounded by highly deformed rocks units. The Central Valley trough has been filled with as much as six vertical miles of sedimentary deposits in the San Joaquin Valley and ten vertical miles of deposits in the Sacramento Valley; these sediments range in age from Jurassic to Holocene. The Sacramento River drains the northern part of the Sacramento Valley, and the San Joaquin River drains the southern part of the San Joaquin Valley.

The geology in the Sacramento Valley relates to three different subbasins within the Sacramento Groundwater Basin: 1) the North American Subbasin; 2) the South American Subbasin; and 3) parts of the Cosumnes Subbasin.

The North American Subbasin lies in the eastern central portion of the Sacramento Groundwater Basin. The Bear River is its northern boundary, the Feather River is its western boundary, and the Sacramento River is its southern boundary. The eastern boundary is a north-south line extending from the Bear River south to Folsom Lake. The eastern boundary represents the approximate edge of the alluvial basin, where little or no groundwater flows into or out of the groundwater basin from the rock of the Sierra Nevada. The eastern portion of the study area is characterized by low, rolling dissected uplands. The western portion is nearly a flat flood basin for the Bear, Feather, Sacramento, and American rivers, and several small east side tributaries. The general direction of drainage is west to southwest at an average grade of about 5 percent (California Department of Water Resources [DWR] 2002, draft Bulletin 118).

The South American Subbasin is bounded on the east by the Sierra Nevada, on the west by the Sacramento River, on the north by the American River, and on the south by the Cosumnes and Mokelumne rivers. These perennial rivers generally create a groundwater divide in the shallow subsurface. There is interaction between groundwater of adjacent subbasins at greater depths (DWR 2002, draft Bulletin 118).

The Cosumnes Subbasin is the area of unconsolidated to semi-consolidated sedimentary deposits bounded on the north and west by the Cosumnes River, on the south by the Mokelumne River, and on the east by consolidated bedrock of the Sierra Nevada Mountains. The Cosumnes Subbasin is bounded on the south and southwest by the Eastern San Joaquin Subbasin and on the north to northwest by the South American Subbasin of the Sacramento Valley Groundwater Basin. The subbasin drains westward through three major rivers, namely the Cosumnes on the north, Dry Creek in the middle, and the Mokelumne River on the south. A large surface water body, the Camanche Reservoir, is located along a portion of the Mokelumne River in the southeast part of the subbasin (DWR 2002, draft Bulletin 118).

The San Joaquin Valley portion of the study area relates to three different subbasins within the San Joaquin Groundwater Basin: 1) the Eastern San Joaquin Subbasin; 2) the Tracy Subbasin; and 3) parts of the Cosumnes Subbasin.

The Eastern San Joaquin Subbasin is the area of unconsolidated to semi-consolidated sedimentary deposits bounded by the Mokelumne River on the north and northwest; San Joaquin River on the west; Stanislaus River on the south; and consolidated bedrock on the east. The Eastern San Joaquin Subbasin is bounded on the south, southwest, and west by the Modesto, Delta-Mendota, and Tracy Subbasins, respectively, and on the northwest and north by the Solano, South American, and Cosumnes Subbasins. The Eastern San Joaquin Subbasin is drained by the San Joaquin River and several of its major tributaries, namely the Stanislaus, and Calaveras, and Mokelumne rivers. The San Joaquin River flows northward into the Sacramento and San Joaquin Delta and discharges into the San Francisco Bay (DWR 2002, draft Bulletin 118).

The Tracy Subbasin is the area of unconsolidated to semi-consolidated sedimentary deposits bounded by the Diablo Range on the west; the Mokelumne and San Joaquin rivers on the north; the San Joaquin River to the east; and the San Joaquin-Stanislaus County line on the south. The Tracy Subbasin is located adjacent to the Eastern San Joaquin Subbasin on the east and the Delta-Mendota Subbasin on the south. All of the above mentioned subbasins are within the larger San Joaquin Valley Groundwater Basin. The Tracy Subbasin also lies to the south of the Sacramento Valley Groundwater Basin, Solano Subbasin. The Tracy Subbasin is drained by the San Joaquin River and one of its major western tributaries, Corral Hollow Creek. The San Joaquin River flows northward into the Sacramento and San Joaquin Delta and discharges into the San Francisco Bay (DWR 2002, draft Bulletin 118).

Geologic Formations in the Study Area

The Proposed Action and alternatives cross three geologic formations (at land surface) between the O'Banion Substation and Tracy Substation. Figure 4-3 shows the geology units that surround the study area. These Quaternary and Tertiary deposits include:

- ***Quaternary Floodbasin (Qb)***—Floodbasin deposits, associated with flood stage on major streams
- ***Quaternary River Deposit (Qr)***—River deposits, associated with river channels, floodplains, and natural levees
- ***Quaternary Continental Deposit (QTc)***—Continental deposits (older alluvium, fanglomerate, and sedimentary formations)

Floodbasin deposits (Qb) crop out in low-lying areas throughout the Central Valley. They result from flood waters entering low-lying basins and depositing mostly fine silt and clay and some fine sand. Floodbasin deposits grade into river deposits, rocks, deposits of Tertiary and Quaternary age, and lacustrine and marsh deposits. As with most deposits of Quaternary age in the valley, contact with underlying deposits is difficult to determine. The DWR stated that the floodbasin deposits in the Sacramento Valley consist of as much as 160 feet of fine-grained sediments in the area west and south of Sacramento. In the San Joaquin Valley, the deposits were estimated to be as much as 100 feet thick (USGS, Prof Paper 1401-C, 1986).

River deposits (Qr) crop out along the major rivers and streams of the Central Valley and include channel and floodplain deposits. River deposits are still accumulating, except where human activity intervenes. Channel deposits, which consist chiefly of sand and gravel, range in width from a few feet to nearly 1,000 feet. Floodplain deposits generally are finer-grained than channel deposits and consist chiefly of sand and silt. They range in width from a few hundred feet to more than three miles. Because soil development and topography are the criteria for mapping river deposits, subsurface contact with underlying deposits is poorly defined. River deposits in the Sacramento area have been described as predominantly coarse-grained at relatively shallow depths that appear

to be hydraulically continuous with the present stream channels, floodplains, and natural levees. The DWR believes that the river deposits are a maximum of about 115 feet thick and that they are the most permeable deposits in the Sacramento Valley (USGS, Prof Paper 1401-C, 1986).

Continental deposits (QTc) are largely of Holocene age; along their outer margins, however, some may be Pleistocene age. The deposits crop out chiefly along the major rivers and streams of the valley, as well as in other low-lying areas, and include river deposits, floodbasin deposits, and sand dunes, all of Holocene age. In places, they may include such deposits as the Modesto Formation of Pleistocene age (USGS, Prof Paper 1401-C, 1986).

Figure 4-3 presents geological deposits in the vicinity of the study area. Segments of transmission lines in relation to local geology are described below.

River deposits pose the greatest concern for building or accessing transmission lines. The deposits consist of sand and gravel, usually unconsolidated, are typically water bearing, and are poor for compaction and drilling. River deposits along the ROW are approximately perpendicular to the route because they follow the rivers west from the Sierra Nevada Mountains. Segments A and A_1 cross about four miles of river deposits along the Feather River from MP 10.0 to 14.0. Segment C crosses river deposits from MP 4.0 to 10.0, and Segment D crosses river deposits from MP 0.0 to 3.0. Segments E and E_1 cross river deposits at the Cosumnes River from MP 2.0 to 4.0 and MP 5.0 to 6.0 at Dry Creek from MP 10.0 to 11.0, and the Mokelumne River from MP 12.0 to 13.0.

The continental deposits are the most geologically stable and are most prevalent along the study area in Sacramento County. Continental deposits are present in Segments A and A_1 from MP 0.0 to 10.0 and MP 14.0 to 22.0 and all of Segments B, F, G, and H.

Continental deposits are again present in Segment D from MP 3.0 to 14.0 and Segment E from MP 0.0 to 2.0, MP 4.0 to 5.0, MP 6.0 to 10.0, MP 11.0 to 12.0, MP 13.0 to 18.0 and MP 44.0 to 46.0. Floodbasin deposits are more suitable for construction than river deposits, but less suitable than continental deposits. In San Joaquin County, floodbasin deposits are the primary material along the proposed routes. Floodbasin deposits are present in Segment E from MP 18.0 to 44.0.

Mining

Several sand and gravel mines are located in the vicinity of the study area including one along Segment D between MP 4.2 and 5.5. Transmission lines can be placed in locations not interfering with these mining operations.

Faults

Earthquakes occur along fault zones. A fault zone is a break in the continuity of a rock formation caused by a shifting or dislodging of the earth's crust. Figure 4-3 shows faults near the study area. The nearest historically active fault is the Concord Fault, approximately 50 miles west of the study area. Displacement on the Dunnigan Fault, about 20 miles west of Segments A, A_1, and C, has occurred within Holocene time (within the last 10,000 years), and the Vernalis Fault, near Tracy, has had activity in the Quaternary Period (within 1.6 million years). The nearest faults to the ROW have not been active within Quaternary times. These include the Willows Fault, the Stockton Fault, and the Midland Fault. The Willows Fault roughly parallels the ROW from the beginning of Segment A and A_1 south to about Segment D MP 7.0 at the Hedge Substation. The fault lies within 1 to 5 miles of the study area and crosses the study area at the O'Banion Substation, Segment A MP 4.0, the Elverta Substation, and coincides with the study area between Segment D MP 2.0 to the Hedge Substation. The Stockton Fault is as close as four miles southeast of the study area between Segment E MP 30.0 and the Tracy Substation. The Midland Fault is as close as 4 miles west of the study area between Segment D MP 12.0 and the Tracy Substation.

Seismicity

A Seismic Zone classification is used by the Uniform Building Code (UBC) to define the magnitude of protection required for building design to withstand earthquake risk in the area or from adjacent areas. UBC Seismic Zones range from 1 to 4 (with Zone 4 having the highest risk) and are based on a 10-percent probability of specific peak ground acceleration (PGA) values being exceeded within 50 years. The entire study area is within UBC Zone 3. All of California is seismically active, with numerous historic earthquakes and seismic activity recorded by instruments daily. Seismic Zone 3 could have earthquakes with a Modified Mercalli Intensity (MMI) rating of VIII or higher. The MMI scale rates earthquakes by their effect on people, structures, and objects. Major structural damage would typically occur from an earthquake with an intensity of VIII or higher. Intensity VIII is generally equated with an average peak acceleration of 20 to 30 centimeters per second (cm/sec). This intensity typically results in slight damage to specially designed structures; considerable damage to ordinary, substantial buildings, with partial collapse; and great damage to poorly built structures. This intensity could also result in falling columns, monuments, and walls (Bolt 1988). Secondary hazards of earthquakes include rapid ground settlement (subsidence), landslides and rockfalls, and liquefaction. These hazards are discussed below.

Subsidence

Land subsidence occurs when the ground surface decreases in elevation. It can be caused by various natural phenomena such as tectonic movement, consolidation, hydrocompaction, or rapid sedimentation. Subsidence can also result from a variety of human activities, including withdrawing water or petroleum from the subsurface. The numerous fine-grained (clayey) lenses in Central Valley deposits are conducive to subsidence. The southern San Joaquin Valley (south of Tracy Substation) has the largest volume of land subsidence in the world (from groundwater withdrawal), and many areas of the Central Valley are vulnerable to this phenomenon. The other important cause of subsidence in the Central Valley is oxidation and compaction of peat soils caused by draining soils nears the confluence of the San Joaquin and Sacramento Rivers. The southern portion of Segment E, from approximately Stockton to Tracy, runs along the edge of an area of subsidence caused by compaction of peat according to a 1952 Field survey (Williamson 1989). Subsidence is typically a slow process, unless induced by seismic activity. Its potential effects on structures might not be evident for years or decades.

Landslides and Rockfalls

Landslides, rockfalls, mudslides, and debris avalanches refer to rock or debris descending a slope due to gravity. Slopes within the study area are typically shallow or nonexistent, making landslides unlikely. Construction in areas with steep slopes should be avoided whenever possible. These limited areas may include the banks of some rivers, levees, or canals.

Liquefaction

Liquefaction occurs when saturated soils lose strength and cohesion when subjected to dynamic forces, such as shaking during an earthquake. Liquefaction can also occur in unsaturated soils with low cohesion, such as sand. Liquefaction and related phenomena have caused tremendous amount of damage during historical earthquakes when water pressure between soil particles can increase until the soil cohesion is lost, along with the support that it normally supplies to building foundations. Liquefaction occurs more frequently in areas where groundwater is very shallow, such as in river deposits near water bodies. Quaternary River Deposits (Segments A, A_1, C, D, E, and E_1) may be prone to liquefaction.

4.7.2 Environmental Consequences

4.7.2.1 Standards of Significance

Significant geologic impacts would result if structures were to fail or create hazards to adjacent property due to slope instability, effects of earthquake, or adverse soil conditions (such as compressible, expansive, or corrosive soils).

4.7.2.2 Environmental Protection Measures

EPMs for geologic resources from Table 3-4 include the following:

- A California registered Professional Geotechnical Engineer would evaluate the potential for geotechnical hazards and unstable slopes on the centerline route and areas of new road construction or widening on slopes with over 15 percent gradient.
- Geological hazards would be evaluated during final design specification for each structure location and road construction area. Options would include avoidance of a poor site by selection of a site with stable conditions, or correction of the unstable slope conditions.

4.7.2.3 Impacts from the Proposed Action, Alternative 1, Alternative 2, Alternative 3, and No Action

No noteworthy geological features were identified to distinguish among the Proposed Action and alternatives. Therefore, the discussion on geology applies to all alternatives. Potential impacts to the Proposed Action and alternatives would be similar, although the specific locations might vary. The route for the Proposed Action and Alternatives 1 and 2 would cross a fault zone that has not been active within the past 1.6 million years; therefore, this is not considered to have more seismic impact than Alternative 3.

Any steep or unstable slopes near the Proposed Action or alternatives ROW would be avoided or minimized with standard construction practices described above. Alternative 3 would cross fewer miles of river deposits than the Proposed Action or other alternatives; however, it would cross 26 miles of floodbasin deposits that could also succumb to earthquake forces, such as liquefaction, more readily than the continental deposits that predominate in the Proposed Action, Alternative 1, and Alternative 2. Geological hazards would be evaluated during final design specification for each structure location and road construction area and standard design practices would be used.

Sand and gravel mining operations (Segment D) would be avoided, and would not be impacted by the Proposed Action or alternatives. No significant geologic impacts are noted for the Proposed Action or alternatives.

4.8 HEALTH AND SAFETY

4.8.1 Affected Environment

This section describes the health and safety issues associated with the Proposed Action and alternatives.

4.8.1.1 Resource Study Area

The resource study area for health and safety depends on the specific health and safety issue. For example, the study area for hazardous materials and herbicides is the area where they are stored, transported, or applied. Fires, electrocutions, and falls could occur anywhere along the transmission line, making the proposed ROW the study area.

4.8.1.2 Issues of Environmental Concern

Issues of environmental concern for health and safety are spills or mishandling of hazardous materials, hazardous waste, herbicides, electrical contact (fires, burns, and electrocutions), and worker falls.

4.8.1.3 Characterization

Hazards can occur under existing conditions as discussed below:

Hazardous Materials and Hazardous waste

Hazardous materials concerns could arise from spills (gasoline, diesel fuel, oil, or solvents) from containers or vehicles. Spills could contaminate soils or leach into ground or surface water. Known storage locations include existing substations (O'Banion, Elverta, Hedge, Hurley, Elk Grove, and Tracy). California-designated hazardous waste has been stored at Tracy and Elverta substations. The waste is managed in accordance with regulations, and is removed for final disposal within allowable time limits. The other substations may store hazardous waste (for example, bushings and oil) for short periods as allowed by regulation.

Western applies herbicides along the existing ROWs (Segments A, B, C, D, E, F, and H) where vegetation threatens the safe operation of the transmission line and related facilities. Herbicide misuse, over-spray, or drift could adversely affect humans, wildlife, vegetation, or water.

Electrical Hazards

Electrical hazards could include vegetation or equipment fires, electrical burns, or electrocutions to humans or animals. Electrical hazards could occur anywhere near energized conductors or facilities (Segments A, B, C, D, E, F, and H). These hazards are primarily a concern for construction and maintenance workers.

Fall Hazards

Fall hazards could affect individuals working at heights. Elevated work is essential for assembly and repair of transmission structures and equipment (Segments A, B, C, D, E, F, and H). Workers typically perform this work from bucket trucks or by climbing structures. In both instances, Western requires workers to use fall-protection devices.

4.8.2 Environmental Consequences

The Proposed Action and alternatives could affect the environment if hazardous materials were released from spills as discussed above.

4.8.2.1 Standards of Significance

The Proposed Action and alternatives would have significant and adverse effect on health and safety if they would:

- Create a public or worker health hazard beyond limits set by health and safety regulatory organizations, or
- Interfere with adopted emergency response plans.

4.8.2.2 Environmental Protection Measures

EPMs for Health and Safety from Table 3-4 include the following:

- Conform with safety requirements for maintaining the flow of public traffic and conduct construction operations to offer the least possible obstruction and inconvenience to public transportation.
- Comply with all applicable health and safety standards.
- Some land uses occurring within the ROW would require temporary closure or limited access. Proper signage would be posted in these areas.
- For identified locations, structures and/or shield wire would be marked with highly visible devices where required by governmental agencies (for example, the Federal Aviation Administration [FAA]).

Each health and safety issue described above is highly regulated by one or more of the following: U.S. Department of Transportation (DOT), EPA, Occupational Safety and Health Administration (OSHA), and DOE, as well as state, county, and local governments. Additionally, Western and its contractors are required to comply with safety and environmental protection policies and guidance developed by Western, including Western's Occupational Safety Program (WAPA Order 3790.1B), the Power System Maintenance Manual (PSMM), the Power System Safety Manual (PSSM), and PSOM.

4.8.2.3 Impacts from the Proposed Action, Alternative 1, Alternative 2, Alternative 3, and No Action

Construction and maintenance activities increase exposure to safety and health hazards. The risk varies among the Proposed Action and alternatives, increasing where substances are stored or transferred, live electrical components are likely to contact vegetation, animals, or

humans, or where workers conduct their tasks at heights. Generally, new construction would be most intensive in worker time and exposure to these hazards, followed by reconductoring, then maintenance. Therefore, the Proposed Action and Alternative 3 would be expected to present more health and safety risk than Alternative 2, followed by Alternative 1. The No Action Alternative would present the least risk. Performed in compliance with all applicable regulations and guidance, activities for the Proposed Action and alternatives would pose no significant threat to the health and safety of workers or the public.

4.9 LAND USE

4.9.1 Affected Environment

The purpose of the land use study was to identify and describe all major land uses, which could be affected by the construction and operation of the Proposed Action and alternatives. Western compiled land use information from maps and existing literature from public agencies and private organizations. Data sources for the baseline inventory included interpretations from USGS 7.5-minute topographic quadrangle sheets and natural color aerial photographs. Baseline data were supplemented by meetings with Federal, state, and county planning, and land management agencies. Several agencies also supplied pertinent documents and maps.

4.9.1.1 Resource Study Area

The land use study area includes the transmission-line corridor and adjacent land uses along the corridor. The study area extended up to 0.5 mile from the ROW for the Proposed Action and alternatives. Appendix E presents aerial photographs of the area around the Proposed Action and alternatives and provides visual examples of the surrounding land.

4.9.1.2 Issues of Environmental Concern

Issues of concern identified during scoping included proximity of transmission lines to residential areas, loss of prime farmland, effects on recreation and open space areas, and potential interference with traffic patterns during construction. Table 4.9-1 presents types of land use compatible within and adjacent to the ROW.

Table 4.9-1. Compatibility of Land Use Types Within and Adjacent to the Transmission Line ROW

Land Use Type	Compatibility with Transmission Line	
	Within ROW	Adjacent to ROW
Residential/Developed Urban	Not allowed, removal of structures	Allowable, potential electrical annoyance and visual effects
Commercial/Industrial	Not allowed, removal of structures	Allowed visual effects and potential interference with access
Airport	Not allowed	Not allowed immediately adjacent to the ROW due to conflicts with aircraft flight paths
Surface Mining/Quarry	Not allowed, cessation of use	Generally allowable
Landfill	Active landfill areas not allowed/cessation of use	Generally allowable
Agricultural Land	Possible land/easement acquisition, but use would be allowed to continue. Some potential interruptions to irrigation, tilling and harvesting techniques. Removal of use at structure footings. Height restrictions for orchard crops and equipment.	Generally allowable
Cemetery	Use would be allowed to continue, possible displacement at structure footings and change in access	Allowable, visual effects
School/Church	Not allowed, removal of structures/cessation of use	Generally allowable. Potential electrical annoyance (radio/TV interference) and visual effects.

Sources: American Electric Power Co., 1995, and adapted from California Public Utilities Commission (CPUC), 1987.
ROW: right-of-way

4.9.1.3 CHARACTERIZATION

Figures 3-1 through 3-8 map the locations of line segments and MPs. Appendex E presents aerial photographs of the study area. The O'Banion Substation is south of the Sutter National Wildlife Refuge and next to the east side of the Sutter Bypass Wildlife Area. Lands crossed by Segments A, A_1, and B, are mostly prime farmland. These segments parallel other existing transmission lines. Segments A and A_1 run along the eastern levee of the Sutter Bypass drainage to MP 9.0. Segments A and A_1 cross the Feather River Wildlife Area (between MP 11.0 and 11.8). A portion of Segment A_1 (MP 17.4 to 20.2) would be realigned to avoid sensitive land uses, including two residential areas (MP 17.6) and the Pleasant Grove Cemetery (MP 18.2).

A portion of Segment B would be located along scattered residential areas containing ranchettes. The residential areas along Segment B are more built up south of Baseline Road (MP 1.5). Segment B parallels other transmission lines, especially from MP 2.8 to the Elverta Substation. Although Segments F and H and a portion of Segment G parallel transmission lines, each segment is located in a more rural area than Segment B. Land uses along Segment G include agriculture and grazing lands. A few scattered residences are located along Segment G (MP 3.0 to 4.0). Segment G (MP 0.0 to 1.7) is the only segment that does not parallel existing transmission lines or ROWs.

Segment C and the northern portion of Segment D parallel other transmission lines within existing ROWs and through the metropolitan Sacramento area. Land uses include a mix of urban residential, commercial, industrial, parks, and recreation areas. Segment C (MP 3.5 to 3.8) would run through several commercial and industrial parking lots. A community park is located at MP 7.3. There are urban residential neighborhoods from MP 4.0 to the American River Parkway (MP 8.7). Segment C passes along the American River Parkway, to the Hurley Substation. Segment D crosses the Parkway (MP 2.5). There is a bicycle path between MP 10.0 and 11.0.

Along Segment D, there is a private school adjacent to the north side of the ROW (MP 1.9). A portion of the school's soccer field and playground are located in the ROW. Mixed land use occurs near MP 1.0, including a senior residence care center and a private recreation facility along with the recreation facility's tennis courts, located in the ROW. Industrial uses include a gravel quarry and an adjacent landfill (MP 4.2 to 5.5). Approaching Hedge Substation, a network of other transmission lines feed into or pass near the substation. Between Hedge and Elk Grove substations Segment D would continue to parallel other transmission lines.

New residential areas are located along the ROW from Calvine Road to the Elk Grove Substation. A park and tennis courts are located within the ROW between Vintage Park Drive and Calvine Road (Segment D, MP10.0). An old cemetery is located west of the ROW at Segment D, MP 13.0. South of Elk Grove Boulevard Segment D, MP 12 to 14, there is a groundwater treatment plant, an asphalt plant, a concrete mix plant, and other industrial facilities. The area around Elk Grove Substation is designated for industrial development by the General Land Use Plan for the City of Elk Grove (Elk Grove, 2002). Grazing occurs in the ROW both north and south of the Elk Grove Substation.

Segments E and E_1 would run through an industrial zone, a golf course, and an area designated for future urban development (MP 0.0 to 0.8). There is a private airstrip about one mile east of the substation. Segments E and E_1 would cross the Cosumnes River and Cosumnes River Preserve near MP 3.4. The Cosumnes River Preserve is public land managed jointly by a consortium of public agencies and private entities. There is a small gas-fired power plant operated by Northern California Power Agency (NCPA) along Segments E and E_1 (MP 21.2). PG&E operates a substation at MP 23.4.

Moving south, Segments E and E_1 cross large areas of prime farmland between MP 10 and 19 with crops including alfalfa, asparagus, tomatoes, and corn. Vineyards (MP 12.5 to 16) are also dispersed along the transmission line ROW. The route would traverse three to five miles west of the communities of Galt (MP 10.1), Lodi (MP 19.0), and Stockton (MP 30.0) and then continue southwest through undeveloped portions of San Joaquin, Contra Costa, and Alameda counties.

Segments E and E_1 would cross the San Joaquin River (MP 29.1). West of Stockton, Segments E and E_1 would cross a series of sloughs (MP 30.0 to 32.0) designated by San Joaquin County as resource conservation areas. The segment would cross over the Mokelumne Aqueduct (MP 30.2) and pass approximately 0.25 mile west of the Rough and Ready Island U.S. Naval Reservation (MP 30.5). Continuing south the line would cross the Middle River (MP 37.5), also designated by San Joaquin County as a resource conservation area.

Segments E and E_1 would pass approximately 0.25 mile southeast of the Clifton Court Forebay (MP 43.7), which is owned by the State of California. The Livermore Yacht Club is located west of MP 45.0, south of the Mendota Canal. The community of Tracy is nine miles southeast of the Tracy Substation. The new planned community of Mountain House is 1.5 miles southeast of Tracy Substation.

4.9.2 Environmental Consequences

4.9.2.1 Standards of Significance

Within the study area, the following types of potential land use impacts are considered significant if the Proposed Action and alternatives would:

- Be inconsistent with adopted land use plans and goals of the community or area in which they are located, including open space designations or other types of areas designated for preservation,
- Cause major conflicts in established recreational areas,
- Convert prime, unique or other farmland of statewide importance to nonagricultural uses,
- Permanently preclude planned land uses over a large area,
- Conflict with existing utility ROWs,
- Cause major traffic delays for a substantial number of motorists, or
- Cause physical damage to roads that is not repaired to a level equal to or better than what existed prior to construction.

The socioeconomics section (4.12) includes significance standards related to some of the potential land use conflicts identified in this section, including standards for potential impacts to residential areas and businesses, public services and the economic-related impacts of converting prime farmland to other uses.

4.9.2.2 Environmental Protection Measures

EPMs for land use issues from Table 3-4 include the following:

- When weather and ground conditions permit, all construction-caused deep ruts that are hazardous to farming operations and to moving equipment would be restored to preconstruction condition, as practical.
- On completion of the work, all work areas except access trails would be scarified or left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion.
- During construction, movement would be limited to the access roads and within a designated area in the ROW to minimize damage to agricultural land.
- Construction operations would be conducted to prevent unnecessary destructing, scarring, or defacing of the natural surroundings to preserve the natural landscape to the extent practicable.
- No permanent discoloring agents would be applied to rocks or vegetation to indicate limits of survey.
- Damaged fences and gates would be repaired or replaced to restore them to their preconstruction condition.
- Some land uses occurring within the ROW would require temporary closure or limited access. Proper signage would be posted in these areas.

For land uses occurring within the ROW (such as the private school's playground and soccer field and the private recreation facility's tennis courts Segment D, MP 1.0 to 2.0), temporary closure and limited access to these areas would be required. Signage would be posted for the length of the temporary closure. The EPMs included in the socioeconomics section (Section 4.12.2.2) are also designed to minimize and avoid potential impacts to other land uses, including nearby residences, businesses, landowners, and motorists during construction.

4.9.2.3 Impacts from Proposed Action—New Transmission O'Banion Substation to Elverta Substation; Realignments; Reconductoring Elverta Substation to Tracy Substation

No significant impacts would result from the Proposed Action. The proposed alignment of the new O'Banion–Elverta transmission line and the realignments are planned and sited to avoid the existing Pleasant Grove Cemetery and residential areas. The new line and ROW along Segment G would be within 0.25 mile of two rural residences, resulting in potential impacts that are addressed in the socioeconomics (Section 4.12) and visual resource sections (Section 4.14). This is the only segment of new line that would not be adjacent to an existing transmission line ROW. This approximate 1.5 mile portion of the Proposed Action route would not conflict with any existing or planned land uses or designations, other than prime farmland. The private school along Segment D (MP 1.9) and private recreation facility/tennis courts would experience indirect short-term construction impacts, and some recreation areas would not be usable during construction.

For Segment A_1, 6.7 acres of prime farmland would be removed from agricultural production where new structures would be placed in the ROW. Removing prime farmland permanently from agricultural use would be a long-term impact. However, farming practices would continue in the new ROW, and the socioeconomics section concluded that the potential economic impacts of removing this land from production would not be significant.

Potential additive impacts to parks, resource conservation, and recreation areas including the American River Parkway would not be significant. All of the Proposed

Action, except about 1.5 miles in Segment G, would be constructed in existing transmission ROW or parallel and adjacent to existing transmission lines. This, along with the fact the Proposed Action would be sited to minimize conflicts with existing land uses, would help avoid new impacts to incompatible and existing land uses. Incremental impacts to recreation and conservation areas would not be significant. As with agricultural uses, most existing recreation uses could continue within the new and existing ROW where the Proposed Action would be constructed. Recreation and conservation areas are not found within the portion of Segment G that would not be parallel to an existing ROW.

Construction could temporarily interfere with the use of local roadways or driveways. Heavy construction equipment may damage study area roadways or driveways. Western's EPMs would avoid and reduce the magnitude of such impacts. These practices include using detours, limiting the area and duration of traffic impacts by carefully siting staging areas and construction traffic routes, making arrangements with local business owners and residences, and repairing any damage that may occur to roadways or driveways during construction.

Reconductoring would cause minimal impacts to existing land uses during short-term maintenance, including the private school (and associated playground and soccer field) and the private recreation facility (and associated tennis courts) along Segment D (MP 1.0 to 2.0).

4.9.2.4 Impacts from Alternative 1— Reconductoring O'Banion Substation to Tracy Substation

Alternative 1 would not result in long-term impacts to prime farmland. This alternative has the potential to cause land use impacts as described for the Proposed Action. For the same reasons as described for the Proposed Action, none of these impacts are expected to be significant.

4.9.2.5 Impacts from Alternative 2—New Transmission O'Banion Substation to Elverta Substation and Realignments

Alternative 2 would remove approximately 6.7 acres of prime farmland from agricultural use (the same as the Proposed Action). All this land would be in Segment A_1. This alternative has the potential to cause the same land use impacts described for the Proposed Action. However, for the same reasons as described for the Proposed Action north of Elverta Substation, none of these impacts are expected to be significant.

4.9.2.6 Impacts from Alternative 3—New Transmission Elk Grove Substation to Tracy Substation

Alternative 3 would remove approximately 15.2 acres of prime farmland from agricultural use (the most of any of the action alternatives). This alternative may cause the same impacts described for the Proposed Action. However, for the same reasons as described for the Proposed Action, none of these impacts are expected to be significant.

4.9.2.7 Impacts from the No Action Alternative

No new land use impacts would occur under the No Action Alternative. The No Action Alternative could continue to have periodic impacts on existing land uses during routine maintenance and operations activities on agricultural lands where crops are located in the ROW. These short-term impacts would not be significant. Under the No Action Alternative, and to minimize crop damage in the ROW, Western would continue to work with landowners regarding scheduling of routine maintenance and operation activities.

4.10 NOISE

4.10.1 Affected Environment

This section describes existing conditions and noise impacts that would result from the Proposed Action and alternatives. Noise is sound that is often considered undesirable because it can interfere with speech, communication, or hearing, or is otherwise annoying. It can be intense enough to damage hearing. Noise decreases with distance from the source. The distance at which sound can be heard depends on the intensity of the sound, meteorological conditions, terrain, and background noise levels.

4.10.1.1 Resource Study Area

Approximately 108 miles of linear features make up the Proposed Action and alternatives study area. The study area is within the counties of Sutter, Sacramento, Placer, San Joaquin, Contra Costa, and Alameda. The study area for noise impacts covers the ROW and areas that could be impacted by noise from the ROW.

4.10.1.2 Issues of Environmental Concern

Potential noise impacts of the Proposed Action and alternatives would be from construction and operation of the line.

Table 4.10-1. Sound Levels for Some Typical Outdoor Noise Sources

Noise Level Decibels (dBA)	Outdoor Noise
110	Jet flyover at 1,000 feet
100	Gas lawn mower at 3 feet
90	Diesel truck at 50 feet
80	Urban daytime noise
70	Gas lawn mower at 100 feet
60	Heavy traffic at 300 feet
50	Quiet urban daytime
40	Quiet urban night time
30	Quiet rural night time
20	Rustling leaves
10	Mosquito at 3 feet

Source: Original 2002

4.10.1.3 Characterization

Sound levels are stated in decibels (dB), a measure of sound pressure compared to a reference sound pressure. Sound levels calculated as decibel, A-weighted sound levels (dBA), approximate the frequency response of the human ear. Table 4.10-1 provides noise levels for typical noise sources.

The study area passes through or near urban areas, mixed agricultural, commercial, industrial, and residential developments, and major freeways and highways. OSHA and the *California Noise Control Act* (California Health and Safety Code Sections 46000-46080) apply to the generation of and exposure to noise. Counties and local governments set noise regulations to protect communities against nuisance noises.

The average day-to-night noise level (L_{dn}), is used as a standard of regulation, and is calculated by adding a 10 dB penalty to sound levels in the night (10 p.m. to 7 a.m.) to compensate for the increased sensitivity to noise during the quieter evening and nighttime hours. The counties along the study area have established a day-to-night standard from the source to residence of 65 dBA L_{dn} that they consider compatible with residential land uses. The EPA has published an outdoor noise level guideline of 55 dBA averaged over 24 hours.

The study area would traverse areas ranging from sparsely inhabited rural and agricultural to metropolitan. Activities near the study area that generate noise above background levels of 30 to 50 dBA would include motor vehicle traffic along the interstates and state routes. Freeway traffic levels can be up to 90 dBA and local traffic noise can be up to 80 dBA. Industrial activities and construction in the Sacramento metropolitan vicinity, trains traveling along the Southern Pacific, Western Pacific, and Central California tracks, agricultural activities, and aircraft flying in and out of Sacramento International Airport and local airstrips also contribute to noise levels near the study area. Interstates 5, 80, and Business 80, and Highways 99, 113, 70, 50, 12, and 4 are other major sources of noise.

4.10.2 Environmental Consequences

4.10.2.1 Standards of Significance

A significant effect from noise would result in

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local noise ordinance, or applicable standards of regulatory agencies,
- Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels where they live, work, or recreate,
- A substantial permanent increase in ambient noise levels in the study area vicinity above levels existing without the study area, or
- Exceeding the regulatory levels of 65 dBA L_{dn} or 55 dBA averaged over 24 hours.

4.10.2.2 Environmental Protection Measures

The EPM for noise resources from Table 3-4 states that all vehicles and equipment would be equipped with required exhaust noise abatement suppression devices.

4.10.2.3 Impacts from Proposed Action—New Transmission O'Banion Substation to Elverta Substation; Realignments; Reconductoring Elverta Substation to Tracy Substation

The Proposed Action and alternatives would require the use of several kinds of construction equipment. Sound levels from typical construction equipment are shown in Table 4.10-2.

Construction activities require various types of work. Reconductoring can be divided into the phases of site preparation and excavation, wire pulling, installation, and cleanup. Construction of new transmission lines is divided into the phases of site preparation and excavation, foundation and concrete pouring, pole erection, wire pulling and installation, and cleanup. Realignment follows the same phases of new construction with the addition of pole and foundation removal and cleanup. Table 4.10-3 shows sound levels from various kinds of construction activities.

Table 4.10-2. Sound Levels from Typical Construction Equipment

Equipment	Average Sound (dBA)	Comments
Dump trucks	91	At 50 feet
Heavy trucks	91	At 50 feet
Welding Machine	73	At 50 feet
Backhoe (0.75 yd^3)	85	At 50 feet
Loader	78	At 50 feet
Grader	87	At 50 feet
Concrete mixer	85	At 50 feet
Movable crane	88	At 50 feet
Generator	78	At 50 feet
Pneumatic tools	85	At 30 feet
Compressor	86	At 50 feet
Trencher	72	At 25 feet
Side boom	80	At 25 feet
Cat tractor	93	At 25 feet
Jackhammer	88	At 50 feet
Hand grinder	82	At 5 feet

Source: US EPA 1971. Noise from Construction Equipment and Operations, US Building Equipment and Home Appliances. Prepared BY Bolt, Beranek, and Newman for US EPA Office of Noise Abatem ent and Control, Washington D.C.
dBA: decibel, A-weighted sound levels
yd^3: cubic yard

Table 4.10-3. Sound Levels from Typical Construction Activities

Activity	Loudest Construction Equipment	Equipment Noise Level (dBA)	Composite Site Noise Level at 50 feet from Source (dBA)
Site preparation and excavation	Dump truck Backhoe	91 85	92
Foundation and concrete pouring	Heavy truck Concrete mixer	91 85	92
Pole erection	Moveable crane Jackhammer	88 88	91
Wire pulling and installation	Moveable crane Heavy truck	88 86	90
Cleanup	Heavy truck Grader	91 87	92

Source: Original 2002
dBA: decibel, A-weighted sound levels

New transmission system construction, removal of transmission structures, access road construction, reconductoring, and pulling operations all generate noise. Estimated maximum noise levels during peak construction at the edge of ROW for the Proposed Action would not exceed 92 dBA. Noise generated at the pulling sites would be about 90 dBA. Commercial businesses and residences would be close enough to the Proposed Action that noise from construction would be noticeable.

Because the work would be of short duration, with intermittent noise only during daylight hours, the limits for day-to-night average noise (65 dBA L_{dn}) and 24-hour average noise (55 dBA $Leq_{(24)}$) would not likely be exceeded beyond the edge of the ROW. At most locations, work would not exceed two to three days at any one location. In addition, feasible noise abatement measures would be implemented. Therefore, noise impacts would be considered insignificant.

Corona discharges at the conductor surface resulting from the electrical breakdown of air into charged particles cause operational noises of transmission lines. Noise would mainly occur during wet weather, with noise levels low enough to blend into the background and not be noticeable beyond the edge of the ROW.

Maintenance of the transmission line would result in the noise of routine inspection vehicles or aircraft periodically during the year. If repairs need to be made, noise would result from vehicles, equipment, and tools.

4.10.2.4 Impacts from Alternative 1—Reconductoring O'Banion Substation to Tracy Substation

Alternative 1 would generate overall less noise than the Proposed Action because only reconductoring would occur. Under Alternative 1, forty percent fewer structures would be constructed and 85 percent less short-term disturbed acreage would result than under the Proposed Action. Therefore, noise impacts would be considered insignificant.

4.10.2.5 Impacts from Alternative 2—New Transmission O'Banion Substation to Elverta Substation and Realignments

Alternative 2 would generate the same level of noise as the Proposed Action between the O'Banion Substation and Elverta Substation. Reconductoring between Elverta Substation and Tracy Substation would not be conducted, thereby decreasing the relative duration of overall noise impacts. Therefore, noise impacts would be considered insignificant.

4.10.2.6 Impacts from Alternative 3—New Transmission Elk Grove Substation to Tracy Substation

Alternative 3 would generate less overall noise than the Proposed Action because construction would be confined between Elk Grove Substation and Tracy Substation. Therefore, noise impacts would be considered insignificant.

4.10.2.7 Impacts from the No Action Alternative

Under the No Action Alternative, maintenance and line inspection activities would continue on the existing lines. There would be periodic noise from inspection aircraft and vehicles, with the associated noise of equipment and tools and the noise would be short term and insignificant.

4.11 PALEONTOLOGICAL RESOURCES

4.11.1 Affected Environment

Paleontological resources are fossilized remains or imprints of multicellular animals and plants (36 CFR Part 261.2). A fossil is the remnant or trace of an organism of a past geologic age, such as a skeleton or leaf imprint, embedded and preserved in the earth's crust. The significance of paleontological resources is subjectively ranked based on the presumed scientific value of proven fossil content. Vertebrate fossils are typically less abundant than invertebrate fossils, and are usually rated more significant. However, well-preserved soft-bodied organisms, including worms, insects, spiders, or rare invertebrate fossils, may be considered highly significant.

Activities affecting paleontological resources on Federal lands would fall under the Federal *Land Policy and Management Act* of 1976 (43 USC 1701 et seq.), which requires public lands to be managed in a manner that protects "scientific qualities" and other values of resources. The *Antiquities Act of 1906* (16 USC 431-433) requires Federal protection for significant paleontological resources on Federally owned lands.

4.11.1.1 Resource Study Area

The study area for paleontological resources is the width of one mile from the ROW centerline. The excavation depth for footings would depend on soil characteristics at each structure location; however, a depth of 10 feet has been assumed for similar projects.

4.11.1.2 Issues of Environmental Concern

The issue of environmental concern for paleontological resources is the potential destruction of significant fossils in the study area. Potential impacts to paleontological resources would be confined to construction activities. The likelihood of impacts from reconductoring would be low because ground disturbance would take place in areas that have already been disturbed when replacing structures. Construction of a new transmission line would necessitate excavation of potentially undisturbed ground and require extensive use of heavy equipment for new structures. Excavation for structures covers largely disturbed agricultural regions north and south of the Sacramento metropolitan area.

4.11.1.3 Characterization

Paleontological resources are defined by the geologic units in which they are found. Fossils are found in sedimentary rocks, which are typically classified into lithostratigraphic units, units of stratified, mainly sedimentary, rocks grouped based on lithology, rather than biologic characteristics or age.

As discussed in Section 4.7 (Geology), three types of geologic formations exist along the transmission corridor between the O'Banion Substation and Tracy Substation (see Figure 4-3), including:

- ***Quaternary Floodbasin (Qb)***—Floodbasin deposits, associated with flood stage on major streams,
- ***Quaternary River Deposit (Qr)***—River deposits, associated with river channels, floodplains, and natural levees, and
- ***Quaternary Continental deposit (QTc)***—Continental deposits (older alluvium, fanglomerates, and sedimentary formations).

The river and floodbasin deposits are Holocene (since the last ice age within the last 11,000 years), and the continental deposits are Pliocene to Holocene. The Pliocene (5.4 - 2.4 million years ago) represents the final stages of a global cooling trend that led up to the ice ages.

In general, the fossil potential for the river deposits is low because this is primarily an erosional environment, whereas the fossil potential for the floodbasin and continental deposits is high, since they are depositional environments. An example of the fossil potential of these units is excavation of bones from a giant ground sloth, bison, and camel, and mammoth tusks at the Arco Arena in 1989 (Butler 2001, Hilton 2002). Arco Arena is about 2 miles west of Segment C MP 6.0, outside the study area. These fossils were found at a depth of 12 to 15 feet and date between 600,000 and 15,000 years old in continental deposits. This was a massive excavation with a much greater likelihood of encountering fossils, when compared to excavations necessary for structure footings.

The Proposed Action and alternatives are in the central portion of California's Central Valley. Literature review

and fossil databases did not reveal any recorded fossil locations within the study area. Lithostratigraphic units within the study area range in age from Holocene to Pliocene. The continental and floodbasin deposits have the potential to contain significant fossils. Much of the existing and proposed routes and alternatives cover large areas of row crops and rice fields. Because of intense cultivation, these areas would generally have a low paleontologic expectation for near-surface soils.

4.11.2 Environmental Consequences

4.11.2.1 Standards of Significance

The Proposed Action and alternatives could have a significant effect on paleontological resources if they would substantially compromise the scientific and educational value of a significant paleontological site.

4.11.2.2 Environmental Protection Measures

EPMs for paleontological resources issues from Table 3-4 include the following:

- Before construction, all supervisory construction personnel would be instructed on the protection of cultural, paleontological, and ecological resources. To assist in this effort, the construction contract would address Federal, state, and tribal laws regarding antiquities, fossils, plants, and wildlife, including collection and removal, and the importance of these resources and the purpose and necessity of protecting them. Western would instruct that cultural resources might be present in the study area. Contract employees would be trained to stop work near any discovery, and notify Western's regional environmental manager, who would confirm that the resource is evaluated and avoided. Known cultural resources would be fenced and a minimum distance maintained for work disturbances.
- Preconstruction surveys of sensitive paleontological areas may be conducted as agreed upon by the land-managing agency and lead Federal agency.

4.11.2.3 Impacts from the Proposed Action, Alternative 1, Alternative 2, and Alternatiave 3

Potential paleontological impacts are essentially proportional to the number of new structures required by a given alternative and the types of deposits on which they would be built. As discussed in Section 4.11.1.3, paleontological resources are unlikely to be present in river deposits (Q_r) and likely to be present in floodbasin (Q_b) or continental deposits (QT_c). Access roads should have negligible impact on paleontological resources because they are not generally associated with excavation. Table 4.11-1 presents the estimated miles and proposed number of new structures that would be constructed on floodbasin, continental, and river deposits.

The Proposed Action would have the greatest number of new structures built on deposits likely to contain paleontological resources. Possible impacts from the Proposed Action and alternatives to paleontological resources would be confined to extremely localized areas (primarily excavations for new structure footings). Excavation for structures covers largely disturbed agricultural regions, so shallow excavations are unlikely to uncover fossils. Monitoring excavations and halting excavation if fossils are encountered would eliminate any significant effect on paleontological resources for the scientific and educational value of a significant paleontological site.

4.11.2.4 Impacts From The No Action Alternative

Under the No Action Alternative, the existing double-circuit 230-kV transmission system between O'Banion Substation and Tracy Substation would continue to operate and be maintained as it is presently. The line would be periodically accessed for routine maintenance or emergency repairs along the existing ROW and access roads. These activities are also consistent with the Proposed Action and action alternatives. This action would have no impact to paleontological resources.

Table 4.11-1. Paleontological Deposits of Concern

DESCRIPTION	Proposed Action	Alternative 1	Alternative 2	Alternative 3	No Action
Miles of study area traversing continental and floodbasin deposits (where paleontological resources would likely be found)	92.6 miles	84 miles	32.2 miles	42 miles	0 miles
Miles of study area traversing river deposits (where paleontological resources would not likely be found)	15.2 miles	15.2 miles	3 miles	4.2 miles	0 miles
Number of new structures likely to be built in continental and floodbasin deposits	282	167	153	204	0

Source: Original 2002